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The Modern Teachers' Series
Edited by WILLIAM C. BAGLEY

RESEARCH METHODS AND TEACHERS' PROBLEMS

The Modern Teachers' Series

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RESEARCH METHODS AND TEACHERS' PROBLEMS

A MANUAL FOR SYSTEMATIC STUDIES OF CLASSROOM PROCEDURE

BY

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EDITOR'S INTRODUCTION

The mastery of dependable methods of work which can be applied to different situations has long been recognized by educational theory as one of the best ways in which to develop the very important trait which we call somewhat cumbrously "adaptability to changing situations." Very specific training not infrequently leaves one helpless when new needs, or new fashions, or changed economic conditions render obsolete the specific abilities that one has been using. New needs are likely to arise in education—and even if new needs do not arise, fashions in teaching change. The specific methods of instruction with which the prospective teacher is equipped in the professional school may be "out of date" within a few years. There must be, of course, some specific training, even if its permanence as an asset cannot be guaranteed; but there is also need for the kind of training that has general procedures or methods of work as its chief objective, and especially the general procedures which have proved their efficacy in the discovery of truth and the elimination of error. It is the latter type of training that the present book will make possible in a measure heretofore unapproached, I believe, in our field.

The authors are unusually well qualified to prepare a book of this type. In his association with the Commonwealth Teacher-Training Study, Dr. Waples had an unusual, if not indeed an unprecedented, opportunity to study the methods of research that are especially significant in the work of education, for some of these methods originated in the Commonwealth study and others were greatly refined as the investigation proceeded. Then, too, the analyses of the actual work that teachers do, which formed so important a part of the Commonwealth study, make an excellent background for the task to which Dr. Waples and Dr. Tyler have addressed themselves. Dr. Tyler is in charge of the division of tests and measures of the Bureau of Educational Research at Ohio State University. I believe that the authors have made a contribution to our professional literature which is not only unique in itself but uniquely rich in its promise of helpfulness to those who are doing the difficult first-hand work of teaching.

WILLIAM C. BAGLEY.

PREFACE

This book is intended to facilitate systematic studies of teachers' classroom problems—studies, that is, which are conducted by supervisors or teachers in service to solve urgent problems of the particular school or class. Such studies differ in many ways from educational research. Research is appropriately conducted by full-time students to discover and validate general principles. Research is accordingly more concerned with delimited problems capable of purely objective treatment than with the complicated problems of the actual classroom. Hence many typical problems in teaching must be studied and solved by other than the rigorous methods of research if the solutions are to benefit classroom practice directly.

But for many such problems in teaching, effective methods of investigation have yet to be developed. Certain methods of research cannot be applied without specialized training and experience. Hence two tasks need to be accomplished. The first is to select from the literature on research the methods of investigation that apply to the problems of which classroom teachers are conscious. The second is to develop such other methods as are needed to supplement the research methods selected, in order that

they may encompass the problems with which genuine research has little to do. This book is a pioneer effort in both directions.

The investigation of teaching problems occupies a position half way between the teacher's off-hand solution of difficulties and the more intricate methods of research. It serves to bridge the present gulf between arbitrary selection of teaching procedures and selection on the basis of valid criteria. The teacher's present basis for selection consists for the most part of opinions and unverified assumptions. The research student selects only on the basis of objective criteria. It is just as unreasonable to expect the teacher to employ only the methods justified by objective evidence as it is to expect the research student to provide objective criteria for all the methods the teacher has occasion to use. Methods of investigation which mediate between the two extremes thus offer the best escape from the dilemma. Such methods utilize the findings and methods of research as far as they go and then employ less precise means of obtaining the additional data required.

Purposes of the text. Various uses of the present volume are indicated in the following paragraphs:

Dewey's recent monograph, *The Sources of a Science of Education*, gives much needed emphasis to the fact that only as all sources are examined for evidence bearing directly on the actual business of teaching are we developing a genuine science of education. The notion that

laboratory studies in contributory sciences, such as educational psychology, constitute contributions to educational science whether they ever affect the work of the classroom or not, is sufficiently widespread to deserve emphatic repudiation. The adaption of research procedures to classroom problems, as attempted in the following chapters, should encourage specialists in research to improve upon the attempt as a means to a more fruitful science.

Another use of the text, to instructors of graduate students, consists in demonstrating the need for investigation of classroom situations before the content of professional literature can be helpfully applied to them. Literature on methods of teaching is for the most part concerned either with general principles or with specific procedures. The literature is so voluminous that a teacher must select procedures either by random experiment or by defining criteria which the right procedure must meet. The very nature of teaching is such that no mechanical identification of methods for type situations will work. The teacher must constantly select, combine, and adapt old procedures to new uses. Hence skill in the collection of evidence whereby such selection becomes more intelligent, is an increasingly important factor in teaching and in the supervision of teachers.

To instructors of extension classes and other classes composed of teachers in service, the materials are useful in presenting the service-study methods ap-

plicable to any branch of subject matter. A common difficulty in organizing such courses is caused by the teacher's indifference to problems in other grades and subjects than his own. The content and organization of this text help to avoid this indifference by allowing each teacher to concentrate on the solution of personal difficulties. "How to investigate the difficulties" then becomes a problem of genuine interest to all members of the group. The technical nature of the text, however, requires some lubrication by the instructor to make the simplicity of the methods apparent to teachers who have had no previous acquaintance with research in any field.

For much the same considerations, the text is useful as a basis for courses in methods of educational research. As at present conducted by various American universities, such courses are intended to help students in formulating problems for graduate theses and to suggest appropriate methods of attack. The specimen studies outlined in chapters III to V and the techniques discussed in chapter VI should serve both of these purposes adequately.

Another type of use involves the collection of data by classroom teachers who are obviously in a better position to collect them than the research specialists by whom the data are analyzed. Data collected expressly for research purposes are often affected unfavorably by the methods of collection employed. Similar data can be accumulated by teachers over a

sufficient period of time by purely routine procedures with less risk of misrepresenting normal conditions. It is thus highly desirable that teachers and supervisors be trained to record data with the completeness and accuracy needed to serve the purpose of the research student.

Investigations conducted by teachers' committees and financed by boards of education have already done important work in the fields of the curriculum and school management. Such studies will be made for better or worse and with or without assistance from persons technically trained in research. However, the failure on the part of persons conducting such studies to distinguish appropriate from inappropriate methods is responsible for much waste. The present text seeks to reduce this waste by presenting simple methods that have been found useful to teachers' committees in attacking similar problems.

The text is useful in much the same way to groups of teachers belonging to the same staff when organized by a superintendent or principal for the study of common problems. The procedures herein described as means of investigating typical problems may be assigned for study to individual members of the group, then applied to the common problems of the class, grade, department, or school.

Organization of the text. From the Table of Contents the reader will note that the volume contains various types of materials for use in planning and conducting

the type of investigation described. The second chapter outlines ten typical problems that are treated intensively in the three chapters following. The ten type problems will be found to cover most of the specific problems in teaching that any teacher or supervisor finds it both necessary and practicable to investigate.

The second chapter also presents master lists of data, sources, and techniques. The master list of data contains the types of information which need to be collected, analyzed, and interpreted in the study of the problems selected. The list of sources contains the particular sources from which the desired data are most reliably and conveniently obtained. From the techniques listed in this chapter and discussed at length in chapter VI, the investigator may select various means of obtaining the desired data from the appropriate sources.

Chapters III to V supply materials that apply to service problems of three general groups; namely, problems pertaining to the treatment of subject matter, problems involving the selection of learning and teaching methods, and problems arising in the management of the class. The first section of each chapter summarizes the considerations of most importance in attacking the various problems covered by the chapter. The remaining sections are devoted to the individual type problems. For each of the type problems, the appropriate section presents (*a*) a

statement of the service problems implied in the type problem; (*b*) a list of the major assumptions to be made in planning the investigation; (*c*) an outline of the essential steps in the investigation; (*d*) a specimen study to illustrate the steps; (*e*) a table showing the relationships between desired data, sources, and techniques involved in problems of the given type; (*f*) a series of specimen service studies to illustrate variations of the procedure, and (*g*) a list of references to other publications and to other sections of the text that afford help in conducting the study.

Perhaps the most inclusive justification for such studies is found in their social value. Methods of investigation defined with reference to teachers' immediate needs are no less useful to society than the first-aid manual as contrasted with the technical treatise on medicine. It is hoped that the limitations of the present text may encourage others to develop an adequate collection and evaluation of research methods for the teacher's self-help in emergencies, since the vitality of teaching as a profession depends to no small degree upon the manner in which such emergencies are met.

D. W.

1930 R. W. T.

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CHAPTER I

SYSTEMATIC STUDIES OF TEACHING PROBLEMS

1. An Illustration

Miss Smith has been teaching in the elementary school for five years. Each year she has taught a class in nature study as a part of the daily work, assigning lessons in the textbook and listening to somewhat mechanical recitations. Miss Smith is not a poor teacher, according to accepted standards. She is energetic, ambitious, and reasonably resourceful, but she has never had occasion to become critical of her work in nature study.

In glancing through a local educational journal one evening she noticed an article dealing with various plans for enriching the school subjects. Among the suggestions was the remark that elementary science appeals strongly to children and can be used as a basis for revitalizing the entire school program. This statement caused Miss Smith to reflect.

"It seems to me," she thought, "that the children in my class are greatly bored by nature study. I shall watch them a bit and find out."

After several days of observation she became con-

vinced that the work was mechanical and that the children were distinctly bored.

It so happened that she was then enrolled in an extension class for the study of teaching problems. It was, accordingly, the natural thing to tell her instructor about her difficulties and to ask for help. Together they planned an investigation which might suggest a solution to the problem. First, Miss Smith read the available literature dealing with the aims proposed for elementary science. From her reading she selected one aim which she considered most important and which she felt to be attainable in her particular class; namely, to have children understand the things in nature that they show most curiosity about.

The next step was to find out 'what things in nature children are most curious about.' To this end she kept a notebook with her and recorded every question about nature which she heard the children ask, whether in the schoolroom, on the playground, in the home, or elsewhere. She also asked the help of several parents who recorded and brought to her the questions which they heard asked by the particular pupils in her nature study class. In a period of six weeks, 148 questions were collected in this way.

Miss Smith was encouraged to find that the questions, when classified, represented specific topics for a new course in nature study. However, she found that she could only answer intelligently about one-half of

the questions herself. This led her to collect and read non-technical books and articles on science for answers to the questions which the children could understand. The answers had then to be organized in a form useful in teaching and the work of organization led her into several other sub-problems which she later attacked. But the effect of this investigation was noticeable from the start. The first introduction of the new material brought the class to life. Through her own efforts the problem first presented by the class is fast disappearing.

Teachers have many such problems to solve, real problems, perplexing problems. Many of them can be partially if not wholly solved by means of similar investigations carried on by teachers themselves. One difficulty has been the rather universal belief that an investigation requires more time than the teacher can spare, coupled with the mistaken idea that any investigation requires an elaborate set-up and specialized training on the part of the investigator.

On the contrary, the foregoing illustration is typical. In scores of actual cases, teachers in service have attacked and solved their most pressing problems by means of informal investigations, solutions which, though not always ideal, have removed existing difficulties. It is the purpose of this book to describe procedures which teachers in service may follow in the investigation of their own problems.

Characteristic Features of this Investigation. — The nature study illustration reveals several characteristic features of such restricted investigations, or service studies, as they might well be called. In the first place, the teacher needed to recognize a problem which had, in her case, existed for some time without her having been fully aware of it. In this illustration the recognition of the problem was due to (*a*) forming a conception of certain desirable attainments in such a class, through her reading; (*b*) taking a measure of the actual attainments in the class, through observation; (*c*) comparing the actual with the desired attainments. The recognition of the problem arose from the discovery that the actual attainments fell short of the desired attainments. Some of the failures to overcome difficulties in teaching are simply failures to recognize teaching problems as such.

In the second place, Miss Smith needed to define her problem in specific terms. The recognition that a problem exists, that one's efforts are not wholly successful, is a gradual process. It originates usually in a rather vague feeling of dissatisfaction. Before the problem can be attacked it must be defined, the attention must be focused upon the definite points of difficulty. In Miss Smith's case, her general problem was, "How may my class in nature study be made more lively?" As a result of her preliminary reading and conference the specific problem selected for investigation was, "What are the natural phenomena about

which children are most curious?" Many perplexing problems are so vaguely apprehended by teachers that they cannot be investigated until they are clearly defined.

In the third place, it was necessary for Miss Smith to plan the service study by determining what data needed to be collected, from what sources the data or information could best be obtained, and what methods of collection could best be applied to these sources.

After her plan had been carried out thus far, that is, after she had collected children's questions about nature, a fourth step was necessary. The collected data had to be interpreted so that useful conclusions might be drawn concerning the original problem. To interpret the findings, then, Miss Smith classified the questions under main headings. These headings served as conclusions or solutions to the original problem, namely, how should this course be organized in order to be more stimulating to pupils. The headings represented questions of particular interest to the pupils of that class and they served also as the organizing basis of the new course in nature study. Hence the problem was temporarily solved.

The four steps thus briefly outlined are the essential features of a service study. In the succeeding sections of this chapter the recognition of problems will be considered in more detail, together with the other significant elements of any investigation.

2. How To Identify Problems For Study

Teachers differ so markedly in their abilities to recognize problem situations that some are inclined to doubt whether this ability can be developed by training.

Yet in classes composed of teachers in service, the authors have seen teachers develop from a state of almost complete insensibility to the problems presented by various groups of pupils to one of keen awareness. This change may safely be attributed in large part to specific training in methods useful in recognizing problems. After the methods have become familiar, the ability to recognize problems develops, like other abilities, by practice.

In the preceding illustration it has been noted that the process whereby Miss Smith became conscious of her problem consisted of three elements. She gained a definite conception of certain desirable attainments from her reading, she made an estimate of the actual attainments of the class, and she compared the actual with the desired attainments. The shortcomings discovered were thus recognized as specific problems. The same three steps or methods can be applied by any teacher who conscientiously seeks to recognize teaching problems.

3. Teachers' Studies and Research

Service Studies are not Research Studies. — One reason for the failure of teachers and supervisors to

investigate their problems is due to a conception that research is the only type of investigation. Many opportunities for self-help are neglected because of failure to distinguish between service studies and research.

Educational research, properly conceived, undertakes to test existing theories and to formulate new ones. Research accordingly belongs to the specialist who has time to carry on a search for abstract truth, no matter where it leads and no matter what practical difficulties arise when his findings are applied to the improvement of existing conditions. Research in the field of teaching tries to determine the effects of various specific conditions upon the processes of teaching and learning. Teaching, however, tries to produce desirable effects and to avoid undesirable effects under the conditions that exist in a given classroom. Hence the problems of research are often conspicuously different from the problems of teachers in service, so different in fact as to discourage most teachers from conducting research as thus defined.

Yet teachers have important problems to solve, and the solutions will be wise or unwise in proportion to the evidence at hand. This evidence can only be secured by investigation. Hence some investigating must be done by someone. Since the research worker has his own theoretical problems to solve, the investigation of service problems must usually be undertaken by the teacher if it is undertaken at all. How much

investigation is necessary depends upon the complexity of the problem and upon the desired results. The investigation may consist simply in preparing a test upon the words used in a given textbook in order to determine whether the text is too difficult for the class; perhaps to identify the vocabulary that needs to be taught before the class can read the book intelligently. Or the investigation may be far more extensive, as when the teacher of nature study or general science undertakes to construct a new course of study on the basis of topics or problems that have special importance in the local community for the particular pupils concerned.

Essential differences between the service study and the research are found in the scope and character of the problems investigated. An example may serve to clarify these differences. Some typical research problems in the teaching of reading as reported by W. S. Gray[1] are: (1) To determine the purposes of oral and silent reading by interviewing more than 900 adults; (2) To determine the relationship between percentage of increase of newspapers and increase in population; (3) To determine the relationship between amount of library reading and percentage of increase in newspapers and periodicals; (4) To determine the relationship between the circulation of ten most widely read

[1] W. S. Gray — *Summary of Investigations Relating to Reading*, Supplementary Educational Monograph No. 28, June, 1925, University of Chicago Press.

magazines and of thirteen "high-brow" magazines; (5) To determine causes of difference in amount and character of reading done in different states by correlating magazine circulation with the Burgess indexes of school efficiency. Now, all of these five research problems might be covered by one service problem stated as follows: What emphasis upon the teaching of reading is demanded by the reading tastes and habits of the local community?

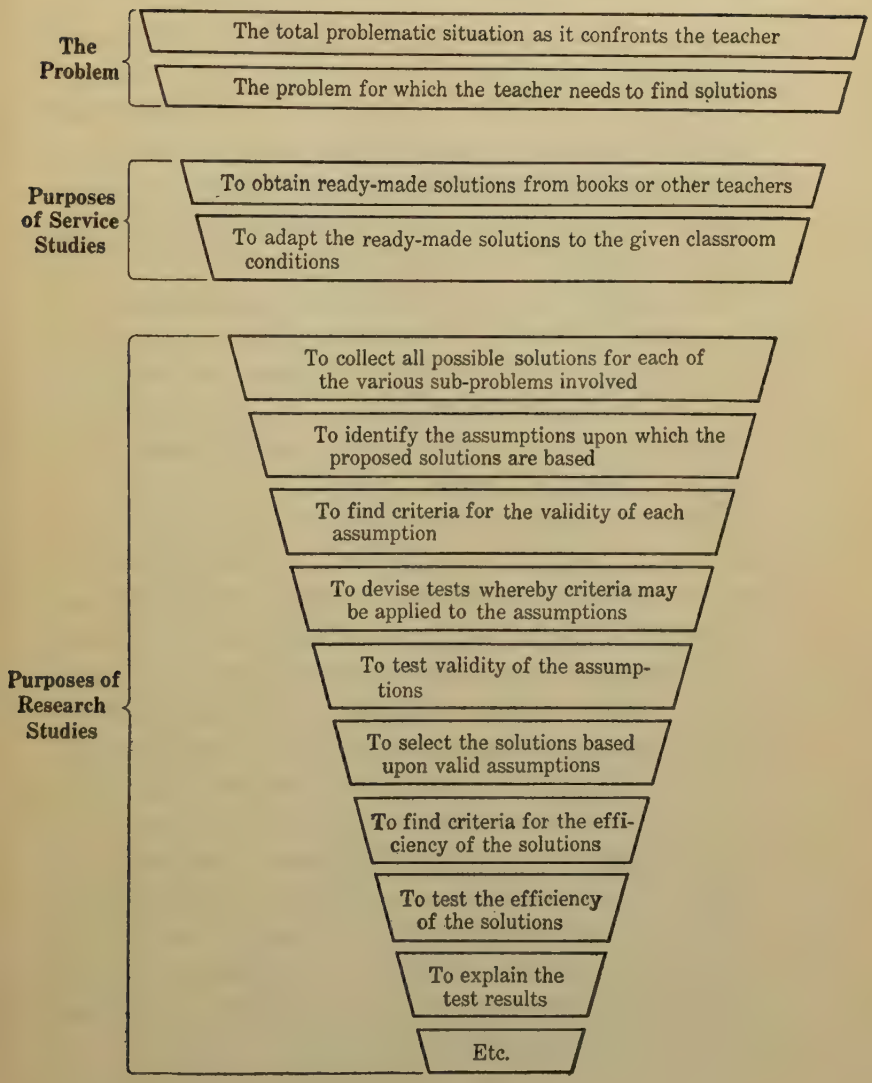
In general, the service problem differs from the research problem in that (1) the service problem is larger in scope, (2) it arises in a particular classroom but need not be confined in it, (3) it necessitates less precise methods of investigation if solutions are to be promptly obtained for the problem as a whole, and (4) it can only be investigated by the average classroom teacher on the basis of various assumptions that can seldom be verified.

The foregoing illustration indicates that the service problem is larger in scope since it lies closer to the classroom situation. Yet the illustration does not bring out the important fact that the scope of any problem is determined by the purpose of the particular study. This fact is better shown in Figure 1, which contains a list of several purposes for which studies of teaching are made. The diagram is intended to suggest that the investigations become more scientific as the problems become smaller in scope, since problems of smaller scope require fewer assumptions. With

fewer assumptions the results are more reliable but they are ordinarily less useful to the teacher. Research problems are usually smaller in scope and consequently their findings are less capable of immediate application in the classroom.

Any study must be planned according to the particular purpose in view. Since the purposes of the service study differ from the purposes of research, it is natural to expect important differences in organization. To present such differences clearly it is well to consider both as related to ordinary thinking.

Ordinary Thinking. — The organization of a systematic study, like any other process of thought, is best described in terms of elements. Ordinary thinking seldom involves more than three such elements that can be clearly distinguished. The three elements are (1) the problem or question that starts the thinking, (2) the data or information by which the thinking is guided, and (3) the conclusion or answer reached. In thinking out an answer to the question — should I assign home work to this class to be done during the Christmas vacation? — the three elements are evident. Simply to ask the question is enough to set the mind working to collect information. One recollects that on former occasions the work so assigned was completed by only a few pupils and that it had to be taken up afresh after the holidays. He compares this recollection with the desire to save time at this stage of the course. He then decides for or against the assignment


The Problem
The total problematic situation as it confronts the teacher
The problem for which the teacher needs to find solutions
Purposes of Service Studies
To obtain ready-made solutions from books or other teachers
To adapt the ready-made solutions to the given classroom conditions
Purposes of Research Studies
To collect all possible solutions for each of the various sub-problems involved
To identify the assumptions upon which the proposed solutions are based
To find criteria for the validity of each assumption
To devise tests whereby criteria may be applied to the assumptions
To test validity of the assumptions
To select the solutions based upon valid assumptions
To find criteria for the efficiency of the solutions
To test the efficiency of the solutions
To explain the test results
Etc.

according to the relative strength of the arguments pro and con.

The Service Study. — The service study represents a method of investigation that is more systematic than ordinary thinking but far less systematic and carefully controlled than the research study. Instead of the three elements that can be clearly distinguished in ordinary thinking, the service study has six; namely, the general problem, a specific problem drawn from the general problem, a body of assumptions regarding the implications of the problem, the sources consulted, the techniques used, and the findings or conclusions obtained from the sources.

A general notion of the elements may be supplied by the following illustration. A teacher of seventh grade English, let us say, is criticized by a supervisor for failure to emphasize certain objectives. The teacher undertakes to investigate the problem thus raised; that is, the teacher seeks to determine what objectives are appropriate for seventh grade English and what criteria may be used in selecting the particular objectives that most require emphasis in the given class.

In the teacher's feeling of dissatisfaction with the present objectives we have an example of the first element; namely, the general problem to be studied. The second element appears in the more specific problem of collecting and evaluating objectives with reference to the given class and subject matter.

The third element is represented by the facts and

assumptions that need to be taken for granted in order to bring the problem within the limits of the teacher's time and ability as an investigator. The teacher needs to assume, for example, that certain objectives have primary importance for all members of the class; that objectives for the teaching of English, as found in books and articles by specialists in this field, are sufficiently trustworthy; that the objectives of most importance for the given class may be selected from the total list of objectives by taking account of the pupils' present attainments in English, by consulting parents and teachers, and by checking the possible objectives against the objectives of eighth grade English for which the pupils must be prepared. Many other assumptions are of course implied, but these will serve for illustration.

The fourth element consists of the sources to be consulted in obtaining the desired information. Among the more productive and accessible sources of data concerning objectives may be mentioned: the pupils themselves; other teachers of the same grade and subject; other teachers of the given class, if any; specialists in the teaching of junior-high-school English; books, articles, and research studies concerned with the problem of defining objectives in the teaching of English; courses of study and textbooks for seventh grade English wherein objectives are stated; and, occasionally, the parents of the pupils concerned, the teachers of eighth-grade English, and members of the community

who for various reasons may be able to indicate the particular types of training in English which junior-high-school pupils should receive.

The fifth element consists of the techniques or methods of obtaining the desired information from the sources. As applied to the sources mentioned the most useful techniques for collecting data would probably include *observation* of pupils at work to discover their major difficulties in reading and writing; *testing* pupils with standardized and other tests of their progress toward each major objective; *interviewing* other teachers and supervisors to obtain their judgments regarding the needs of the given class and the relative importance of different objectives; *analyzing* the literature on objectives to obtain a comprehensive list of objectives and of criteria for their selection.

The sixth element is composed of the data obtained, which ordinarily represent the conclusions of the service study. Sometimes the data consist of explicit directions for the solution of the problem, as when the teacher lays the problem before an expert or group of experts and receives a solution ready-made. More frequently, however, the data obtained from the sources need to be interpreted and applied to the problem before satisfactory conclusions are reached. In the study to determine objectives, for example, the data would consist of objectives for seventh grade English as proposed by authorities; lists of errors, difficulties, and other indications of pupils' needs as revealed by tests;

various principles governing the selection of objectives for pupils of the given type of community, and more detailed objectives proposed for different units of the course as found in textbooks and courses of study. To draw satisfactory conclusions from such data with regard to the original problem, the teacher would need to check one type of data against the other data obtained. That is to say, the evidence concerning the pupils' needs would be compared with the objectives proposed for the seventh grade course by the textbooks and courses of study. When a tentative list of objectives is drawn up, the teacher would apply each objective to the subject matter of the course in order to see which are most appropriate. Other objectives proposed by educational authorities might then be considered in order to check the completeness of the list. In this way the teacher would arrive at a list of objectives related to the given course which the supervisor would probably accept as valid.

The Research Study. — The distinction between research and service studies *as such* is a matter of degree. Many studies might be cited which combine the characteristic features of both types. To obtain a working definition of the research study it is thus necessary to make an arbitrary distinction. For present purposes it will be satisfactory to define the research study as a technical monograph, written by one who has received his doctor's degree, and published by a recognized graduate faculty of education in a university series

with some such title as "Scientific Contributions to Education." This definition will be found to exclude most of the studies employing methods that clearly fail to meet the accepted standards of research.

The simpler organization of the service study has already been found to consist in the interrelation of six content elements. The same elements appear in the research study, except that findings and conclusions should perhaps be regarded as separate elements, thus raising the total number of elements to seven. The service study begins with the problem as a whole and proceeds directly to certain conclusions on the basis of the assumptions made. The research study is narrower in scope and repeats this process at least four times to insure greater accuracy in reasoning. The research study, in other words, typically represents four cycles of reasoning from data to conclusions, each cycle following the pattern of the service study. The following outline may illustrate the manner in which the elements are organized in research studies of a superior type.[1]

[1] This type-structure of the research investigation and the following discussion of assumptions and standards are based upon an intensive analysis of sixty educational monographs. The monographs were selected from the University of Chicago Supplementary Educational Monographs, the Teachers College Contributions to Education of Columbia University, the George Peabody Contributions to Education, and the monographs issued by the Bureau of Educational Research, Ohio State University. The selection was based upon the nature of the problems investigated, the sources consulted, and the techniques employed.

TABLE I

STRUCTURE OF A RESEARCH STUDY AS COMPOSED OF SEVEN CONTENT ELEMENTS, ORGANIZED IN FOUR CYCLES OF FOUR ELEMENTS EACH

A. 1. Statement of the problem or title of the study.
2. Assumptions regarding the nature of sub-problems implied.
3. Techniques for defining the sub-problems to be investigated.
4. Definition of the hypotheses or sub-problems.

B. 1. Statement of the hypotheses or sub-problems defined for investigation.
2. Assumptions regarding the data required to throw light on the sub-problems.
3. Techniques for selecting sources from which the data may be obtained.
4. Selection of the sources.

C. 1. Statement of the sources selected.
2. Assumptions regarding the techniques most applicable to the sources.
3. Techniques for obtaining data from the sources.
4. The findings obtained by applying the techniques.

D. 1. Statement of the findings.
2. Assumptions regarding interpretations of the findings.
3. Techniques or criteria for testing the interpretations.
4. Conclusions applied to the original problem.

Critical Importance of Assumptions. — The noteworthy fact which the table reveals is that any investigation stands or falls on its assumptions. If one could omit the assumptions from each group of ele-

ments, the remaining elements might be treated with scientific precision, since they are almost entirely mechanical. Yet the assumptions are the vital element of the study. The restriction of the problem, the selection of sources and techniques to fit the problem, the statement of findings, and the choice of criteria for use in drawing conclusions, are all based upon assumptions which may or may not be valid. Research in the exact sciences of mathematics and physics is a model of scientific thinking for the reason that each assumption made at each of the four stages of the study is either carefully defined or thoroughly tested. It is desirable for each assumption to be discussed in terms of the evidence available for its support. All assumptions should at least be pointed out.

Methods of research in the social sciences might be greatly improved if each investigator would similarly identify and check all assumptions made at each step of the investigation. Some educational research at present is based upon assumptions that do not bear critical examination. On this account some such rules as the following should be religiously observed in educational research until a higher level of scientific procedure can be attained: First, all significant assumptions should be stated that are implied by any statement not fully supported by objective evidence. Second, the unsupported assumptions should be discussed at whatever length is necessary to show what pertinent evidence exists or how such evidence may be secured. Each of

the assumptions not fully supported thus becomes a problem for further study by later students if not by the investigator himself. Furthermore, the conclusions of the given study can be modified so far as necessary if at any time an important assumption is invalidated by further research. When assumptions are not stated, other students in the field can never tell to what extent the findings of a given study are affected by subsequent research in the same field. Third, all assumptions for which no evidence is available should be critically examined in order to show their plausibility. The reader is thereby enabled to follow the investigator with greater confidence and fuller understanding.

Differences in Applications. — *Research.* Research aims at generalizations. Methods of teaching and learning that are only applicable in a single classroom have little significance for the profession as a whole. Hence, research seeks to define general principles that apply universally. For this reason, in research it is necessary to eliminate or to make allowance for all variations among classrooms, teachers, groups of pupils, or other factors influencing the results. But this attempt to eliminate variable factors or to determine their effects is very difficult. It commonly involves large numbers of cases and long intervals of time; or it may demand preliminary studies to select cases for study in which variable elements are reduced to a minimum. Examples of such procedures are to be found in studies using control groups, those using large

numbers of pupils (5000 or more), those covering many parts of the country, and numerous other types. Much of the time and expense of a research is due to the demand for findings that have universal application.

The Service Study. In marked contrast with such extensive investigations, the service study has a very restricted application. The service problem arises in a particular classroom, in a particular community, with a particular group of pupils, under a particular teacher. The problem will have been satisfactorily solved if the solution is successful in that one classroom. Hence the investigation is reduced to the collection and consideration of only those data which apply to the particular situation. This represents a large reduction in the labor and time required for the investigation. It is for this reason that teachers in service can investigate their own problems with the hope of reaching solutions that may be somewhat directly applied to the actual problems confronting them.

Features Common to Research and Service Studies. — In the preceding paragraphs the differences between research and service studies were emphasized, especially those differences which make it possible for investigations to be successfully undertaken by teachers who have not the time, the facilities, nor the training requisite for research. Two other features of research, however, are equally important in service studies;

namely, the systematic planning of procedure and the careful checking of results at each step. Since the major part of this volume is concerned with the planning of procedure, no comment on this topic is needed here. However, the matter of selecting the criteria by which to check each step may be discussed to suggest the similarity between research and service studies.

A service study cannot attain the completeness of a research, but the difference is only one of degree. Within the limits of the time and sources available, a complete check should be made of possible solutions. Too often, one is tempted to accept the first plausible solution that presents itself. In the long run, the solutions will be found more satisfactory when all of the available data are collected and at hand before a decision is made.

Both the research and the service study require the use of standards as a means of checking results, but different standards must be formulated for each. Such standards or criteria range all the way from personal judgment to exact, objective evidence. In studying a personal teaching problem, the teacher's judgment is one important criterion of success. If the teacher be a person of poor judgment who collects bits of evidence to justify inefficient methods of teaching, there is no power short of supervisory authority to convince him that the evidence is not valid. On the other hand, no matter how earnestly the teacher studies an actual

classroom problem with every precaution against false inferences, his conclusions will not exclude personal judgment and, of course, should not.

One must not conclude from these remarks that no other criteria may be applied to service studies than the investigator's personal estimate of his results, which is, strictly speaking, no criterion at all. The sort of teacher whose curiosity to discover useful evidence leads him to undertake a service study will seldom rely entirely on his personal opinion concerning the value of the evidence. The methods outlined in the following chapters for investigating service problems accordingly provide for checking the findings by whatever criteria are ordinarily necessary to justify their use in the classroom.

Of such criteria the most easy to apply is the judgment of other teachers of the subject or authorities on the particular problem studied. Persons who can be interviewed personally are obviously more useful as critics than persons at a distance whose judgments can be obtained only by correspondence or by referring to their publications. Next in order of value to the teacher in service is the classroom experiment when the results are accurately recorded and, when possible, tested objectively. The nature of the objective test cannot be indicated except in terms of the given problem. No objective test, for example, could be used to evaluate the aims of a given course, except in so far as the test results might show how far certain aims are

attainable by the given pupils. The combined judgments of competent authorities on the teaching of seventh-grade English would be a better check upon the importance of the aims determined by the teacher's investigation.

Another type of checking consists in bearing in mind certain qualities that apply to different steps in the investigation. Such standards or ideals of research may be determined by examining the best research studies in various fields. For example, such examination reveals that the sources selected for any desired data should so far as possible be *accessible*, *adequate*, *inclusive*, *primary*, *productive*, and *representative*. Likewise the techniques for collecting data from the sources should be *adequate*, *applicable by others*, *inclusive*, *objective*, *practicable*, and *reliable*. For further illustration, the conclusions of the study should be *accurate*, *capable of verification*, *consistent*, *explicit*, *logically organized*, *reliable*, *specific*, and *valid*. While such adjectives have no clear meaning unless followed by concrete examples, they serve to emphasize the great importance of each decision with regard to the treatment of content elements.

Such standards for the guidance of the investigator are perhaps even more essential in the treatment of formal elements, such as preparation of tables, graphs, summaries, statement of definitions, limitations, and the like. Since these features of a recorded investigation are purely mechanical, there is no reason why the

best forms should not invariably be employed. More concern for such standards in all educational research would do much to increase its value and to win the respect of workers in sciences where casual assumptions are not tolerated.[1]

4. Summary

This chapter has undertaken to describe the important features of a service study. Such a study involves recognizing a problem, defining the problem in specific terms, planning and carrying out the investigation, and interpreting the findings.

The service study has been further described by contrasting and comparing certain important features with the corresponding features of a research. Three features are different; namely, the problem investigated, the organization of elements composing the investigation, and the range of situations to which the findings apply. Four features are similar; namely, systematic planning, completeness, criteria applied to the study, and techniques of investigation.

[1] It will be noted that the standards just mentioned represent scientific ideals toward which the research student should strive. Ideals of scientific workmanship are closely allied with the personal ideals that largely determine any student's qualifications for research. Various other qualifications have been specified in terms of personal traits. Several accounts of these are to be found in the chapter references. But see especially Courtis, S. A.: *The Development of Ability in Research, Studies in Education, Yearbook No. XV*, The National Society of College Teachers of Education, pp. 85, 1926. Quoted by A. J. Jones, Chairman, "An Outline of Methods of Research," *U. S. Bureau of Education Bulletin, No. 24, 1926.*

The service problem consists in a classroom condition or situation which prevents the teacher's attainment of the objectives or outcomes desired. The problem is thus encountered by an individual teacher or small group of teachers in a particular class, department, or school. The problem is large in scope since the investigation to be successful must help to remove all the obstacles confronting the teacher in the given situation.

The organization of the service study consists in defining the problem, making plausible assumptions as to methods of investigating it, selecting appropriate sources of information, applying suitable techniques to the sources, and arriving at workable conclusions. Because the service problem is too large to be covered by purely objective evidence, the assumptions giving direction to the study must often be arbitrary. All assumptions, however, should be plausible and their plausibility should be examined in the light of available evidence.

The findings of a service study have served their purpose when they remove the difficulty encountered. Hence, the results do not always need to be validated in other communities, in other schools, or by other teachers. This characteristic makes it possible for teachers to conduct service studies without a great expenditure of time or labor.

Systematic planning, so essential in research, is also highly desirable in service investigations. Usually, the

amount of careful and systematic planning determines the success of the study.

Completeness is the characteristic which distinguishes a service study from an off-hand solution of a teaching problem. Completeness and precision to the degree demanded in research are neither possible nor necessary. Nevertheless, careful checking of as complete a list of data as time and facilities permit, increases very greatly the chance of a satisfactory solution.

Criteria for the results of the service study are largely confined to the teachers' personal judgments, the judgments of competent critics, the data obtained from other studies of similar problems, and the results of informal classroom experiments. The findings of a service study are adequate if they indicate which of the available teaching procedures are best under the given conditions. Criteria for the methods of conducting the service study involve the ideals of scientific thinking, in so far as such ideals can be approximated in the time available for the study. The criteria also involve the personal qualifications of the investigator. The latter are the same for any investigation.

A number of techniques have been utilized in research which are readily applicable to service studies. One purpose of this book is to describe and illustrate such techniques.

In conclusion, the service study offers a means of self-help to those teachers confronted by serious problems who have no expert supervision upon which

to rely. It also offers a means for increasing the satisfactions of teaching by collecting data which can be used for more intensive study by specialists in educational research, who, in turn, may be able to utilize such data, to obtain findings which can be applied to urgent classroom problems. This book contains suggestions that are intended to simplify the planning and conducting of such studies.

5. Bibliography

The references cited in the text are of two types, namely, references in which the investigator will find suggestions directly pertinent to the problems, and references which either explain or illustrate various methods of investigating the problems.

The number of references of the first type would have been much larger were it not for the fact that only the more accessible references are cited. Studies appearing as theses or as monographs in series seldom found in school libraries or fair-sized public libraries have been omitted on that account. A comparison of the lists for the various sections will indicate that the accessible studies related to some of the type problems are far more numerous than those related to others. Several recent bibliographies have been consulted in making the selection, notably the bibliographies edited by W. S. Monroe. The most useful single bibliography for use in connection with this text is probably "Ten Years of Educational Research," by W. S. Monroe

and others, *University of Illinois Bulletin*, Vol. XXV, No. 51; Bureau of Educational Research No. 42, August, 1928.

The references have been classified according to the sections of each chapter. This arrangement has the advantage of distinguishing general references that apply to the chapter as a whole from studies confined to specific problems. Since the first sections of Chapters III, IV, and V are summaries, the general references are found at the close of these first sections. The technical references of a general nature are similarly placed after the sections of Chapter II. The specific technical references are classified by sections in Chapter VI.

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CHAPTER II

PLANNING THE STUDY

The service study is defined in the previous chapter by contrast with the research study. While no hard and fast line could be drawn, it was shown that a service study is far simpler and that its simplicity results from the use of assumptions not legitimate in a research study. The present chapter undertakes to define certain principles governing the important steps in planning and conducting service studies. Certain materials are provided for use in applying the appropriate principles to each step. The chapter is thus intended for reference in connection with later chapters devoted to the investigation of typical service problems.

1. Major Steps

For sake of emphasis it may be well to review the essential steps in planning the service study. In the first place, one must always *define the actual problem in terms of the data that can be obtained.* If the problem consists in adapting group methods of instruction to the needs of individual pupils, the problem might be stated: "To collect the specific difficulties of individual pupils which the present methods of teaching

fail to remove and to devise other methods which will remove them—in the study of Longfellow's *Evangeline* in the seventh grade," or in whatever other subjects and grades the problem occurs. To translate in this way a teaching difficulty into a problem capable of solution is often the most critical step in planning a study. One will not go far wrong if the problem is stated in terms of "things to be collected," the "things" being either facts to be taught, interests to be developed, activities to be performed, difficulties to be overcome, methods to be used, or other distinct types of data that are needed to solve the problem.

In the second place, one must *decide where the data may be found.* He must decide what sources are best. In selecting the sources he must choose not only the sources that are reliable but the sources that can be consulted easily because they lie close at hand. To collect the pupils' difficulties in the study of *Evangeline* one might examine various research studies of children's reading to see what difficulties are most common. The research studies would probably represent a reliable source. But a far more convenient and equally reliable source would be the pupils of the particular class concerned. The actual difficulties could best be identified by studying the pupils at work; also by consulting other teachers of the same class, and possibly by consulting parents of the pupils whose troubles are not readily located.

A third step is to *write down the data desired, the*

sources selected, and the methods by which the data can best be obtained from the sources. This will then serve as an outline of the study to be revised whenever desirable. It is seldom difficult to decide how best to secure the data from the sources when one knows what methods or techniques are available. The following chapters of this text contain lists of such methods with examples of their use, so that the appropriate techniques may be chosen with reference to the data needed and the sources available.

Probably the best method of obtaining the pupils' difficulties in *Evangeline* would be to give a test on the points which the class is expected to learn and thus discover what pupils are in need of help. One might then show both the test and the results to two or three other teachers who are considered among the best teachers of junior high-school literature in the district. These teachers should be asked first of all to criticize the test. It may be that the points which the teacher is trying to teach should not be taught at all to that particular class. If the teacher's objectives are poorly chosen or poorly emphasized, it is only to be expected that the class should have difficulties. If the test is approved by the critics, the teacher making the study may then proceed to interview the pupils, to observe their methods of study, to find out about their previous work in English, and to collect other information that will show definitely where the trouble lies. When the pupils' difficulties have been located somewhat definite-

ly, the teacher may then collect methods of removing each difficulty by consulting other teachers and by reading books and articles dealing with the particular problems. When the methods have been collected, the teacher may find out which methods are best by trying them out systematically upon the class as a whole or upon the individual pupils concerned.

The three steps just described are the essential steps in planning a service study. Each step might easily be analyzed in far greater detail if it were desired to outline methods of conducting the study. To present a detailed list of steps for service studies in general would not, however, be useful; since such steps have little meaning until they are stated in terms of a particular problem.

Elements. — It should nevertheless be noted that the three steps involve at least five[1] different elements that are present in any service study. In constructing the plan of any service study one must deal with each one of these elements, and the plan itself consists in combining the elements in whatever manner is best for the given problem. Each of the five elements, moreover, represents several types, and it is important that the proper type be selected. It is accordingly necessary in planning a service study for the investigator to have a clear notion of what the different types of

[1] As discussed in the previous chapter, the number of elements was six. The sixth, "findings or conclusions," is obviously essential in the actual study but not in the plan of the study. This chapter is concerned merely with planning.

each element are and how to combine them to best advantage in his study of the given problem. The five elements are (1) the problem, (2) the data needed to investigate the problem, (3) the assumptions needed to support the plan of attack, (4) the sources to be consulted, and (5) the techniques or methods of obtaining the data from the sources. Each element will be considered in turn and the main types of each element will be presented.

The master lists of each element, excepting the assumptions which are discussed in connection with the elements to which they apply, are shown in the following sections. These were determined by analyzing 144 service studies into their component items and then classifying the specific items under appropriate types. The master lists are useful in planning a service study since they suggest the types of each element that are best combined with other elements in the study of any given problem. The types are here presented without more comment than is necessary to show how each master list is used. Chapter VI contains a more systematic discussion and illustration of techniques.

2. Problems Met in Service

The purpose of this section is to present materials that are useful in what is the first and usually the most difficult step of a service study; namely, the formulation of the problem. In formulating a service

problem the two considerations of most importance are the scope or depth of the problem to be studied and the assumptions by which the scope of a problem is determined.

Scope. — The service problem to be investigated must be neither too deep nor too shallow. It is not wise to "investigate" so complicated a problem as "how to teach efficient habits of silent reading." The best that one can do is to read up on the subject, note the methods of teaching silent reading that are recommended by authorities, and then experiment with such methods until more specific problems are located. The more specific problems may then be investigated. On the other hand, it is equally futile to investigate a superficial problem that can be solved to better advantage by direct experiment than by any sort of systematic study. An example of such a problem would be: "Should pupils place their names on the left side or on the right side of the written papers turned in?"

Assumptions Useful in Restricting the Problem. — Problems differ not merely in scope but also in degree of analysis. How far a given classroom situation should be analyzed by a given teacher or supervisor depends very largely upon the individual's professional knowledge and the facilities available for the investigation. Generally speaking, the more the investigator knows, the farther the analysis may be carried. Hence we find the very specific problems of research investigated

by persons who are familiar with the entire field in which the problems arise. The problems met by the beginning teacher, however, because they are not analyzed far enough, often defy systematic investigation — for example, "how to appear self-confident in meeting the first class," "how to establish cordial relations with pupils," "how to anticipate pupils' questions so as to avoid being 'shown up' in class discussion." Some analysis of the classroom situation into specific problems is essential to a systematic investigation. The farther the analysis is carried, the more possible it is to employ purely objective techniques.

To restrict the problem for investigation to one which is definite enough for the investigator to attack is an essential task in any study. To this end only one definite problem should be attacked at one time. Other difficulties are not to be investigated until the first problem has been studied. For example, a beginning teacher who is for the time being pre-occupied by the problem of developing self-confidence, must assume that personal relations with pupils, methods of class management, methods of teaching, and the other conditions indicated are satisfactory. Unless such assumptions are made, the teacher cannot concentrate his energies on the problem of developing self-confidence. This likewise applies to the experienced and successful teacher whose major concern may be the selection of objectives for a given course. This teacher would

naturally assume to be satisfactory such conditions as his personal traits and relations with pupils, methods of management and teaching, and the content of the given course and curriculum. He is then free to concentrate on the problem of selecting objectives. By restricting the problem to one phase of the situation, the investigator necessarily assumes or takes for granted the conditions represented by the phases not studied. Thus by stating the conditions which for purposes of the investigation are taken for granted, the investigator may restrict the problem to any desired limits.

Standards. — Service problems that are well adapted to investigation have several characteristics in common. The characteristics represent standards in the formulation of any problem for study. The standards are noted here for reference and are illustrated by the problems appearing in the master list on the following pages.

STANDARDS GOVERNING THE FORMULATION OF PROBLEMS FOR SERVICE STUDIES

1. The problem should be formulated so as to indicate the types of data to be collected and the nature of the conclusions to be reached by interpreting the data.

2. The problem chosen for study should anticipate conclusions that may be directly applied to a classroom problem of genuine importance for the teacher or teachers concerned; that is, the problem for investigation should include factors that are significant in the classroom situation.

3. The problem should be sufficiently definite to exclude all subjective factors and other conditions that can be excluded without serious loss to the practical value of the conclusions reached.

4. The conditions that are excluded from the investigation but which determine the practical value of the conclusions reached should be stated in the form of assumptions subject to later investigation.

The foregoing standards are presented in abstract terms to enable the reader to cover them rapidly. The following typical service problems will be found to approximate the standards in varying degrees. The reader may thus clarify his notion of each standard by applying it to the individual problems listed. The master list is of practical use as an aid in formulating original service problems for investigation.

Master List of Service Problems
(Obtained by analysis of representative service studies)

I. The Curriculum

A. Defining Objectives

Classroom Problems

1. How to determine the specific outcomes desired for a given course with reference to the objectives proposed by authorities.
2. How to define objectives in a given subject for a given pupil group with reference to data concerning social environment, vocational prospects, and aptitudes.

Problem formulated for investigation

To collect specific outcomes for a given course with reference both to the major objectives proposed by authorities and to the abilities, social environment, and vocational prospects of a given class of pupils.

B. Constructing or reorganizing the course.

Classroom problems

1. How to select the major units of a course from text materials and other studies available.
2. How to select content for a given unit with reference to a typical class.

Problem formulated for investigation

To determine the main units or topical divisions of a course which are directly related to the objectives and which will serve as a basis for organizing the course material in whatever manner will make it most easy for pupils to understand; also to find appropriate content for each unit.

C. Selecting text materials.

Classroom problems

1. How to select texts for a given course.
2. How to determine relative difficulty of texts available for a given course.
3. How to determine relative interest of a given class in various texts available.

Problem formulated for investigation

To select on the basis of adequate criteria one or more textbooks and references for use in a given course

and school from the textbooks and other pertinent literature available.

D. Adapting prescribed materials to a given class.

Classroom problems

1. How to adapt the logical chapter units of a textbook to a series of units that are more readily learned by a given class.
2. How to determine the desirable emphasis of prescribed materials with reference to the peculiar needs of superior and inferior pupils in a given class.

Problem formulated for investigation

To determine the particular needs of a given class which require some modification of the subject matter prescribed for the course, and to modify the subject matter accordingly.

II. Method

A. Selecting learning procedures.

Classroom problems

1. Assuming that materials are well selected and organized for a given class and course, how to select from accessible sources the most efficient methods of presenting such materials and directing pupils' study of them.
2. How to adapt group methods to difficulties met by individual pupils.

Problem formulated for investigation

To determine the major difficulties confronting pupils in a given course and to organize a general plan of in-

struction based upon suggestions from professional literature toward removing such difficulties.

B. Constructing Exercises and Guide Sheets.

Classroom problems

1. How to prepare exercises for use in
   a. applying principles to life situations,
   b. emphasizing functional relationships between several subjects learned separately,
   c. developing specific habits — e.g., efficient reading, efficient use of text book, organizing written work, et al.,
   d. inducing principles from laboratory and other situations.
2. How to prepare practice exercises for specific types of drill.
3. How to prepare guide sheets adapted to the needs of different ability groups within the class for different desired outcomes and content materials.

Problem formulated for investigation

To prepare exercises or direction sheets for use in a given class by determining the points in need of explanation or the materials that need to be supplied in addition to the prescribed materials.

C. Motivating.

Classroom problems

1. How to determine group interests for use in organizing and presenting materials.
2. How to determine individual interests requiring adaptation of group methods.
3. How to select efficient motivating devices.

Problem formulated for investigation

To identify the specific conditions that may explain failure of a class or of individual pupils to co-operate satisfactorily in the classwork; also to develop means of removing such conditions and of increasing the energy with which any assignment is studied.

D. Testing.

Classroom problems

1. What types of test are best adapted to each type of desired outcome in the given course or unit.
2. How to construct tests to measure the pupils' ability to apply each unit of a given course to life situations.
3. How to determine the relative difficulty of the principles and skills involved in a given unit as a means of testing the subject matter taught.

Problem formulated for investigation

To construct tests that shall efficiently measure the pupil's attainment of each of the desired outcomes of the course or unit.

III. Management

A. Grading and Sectioning Pupils.

Classroom problems

1. How to identify at the outset of a course or unit the individual pupils.
   a. who require special treatment.
   b. who are not sufficiently prepared or sufficiently able to benefit by the course.
   c. whose background or superior ability justifies exemption from the routine work of the course.

2. How to group pupils efficiently for purposes of instruction.

Problem formulated for investigation

To determine pupils' special abilities, disabilities, interests, and personal traits as a basis for homogeneous grouping in grades, classes, or class sections.

B. Managing a Class.

Classroom problems

1. How to determine time required for typical learning activities for the purpose of distributing the available time according to the importance of the activities.
2. How to teach efficient performance of routine duties.
3. How to determine procedures in directing and supervising study that are most efficient when applied to a given course or class.
4. How to overcome difficulties resulting from inadequate facilities of time, space, and other essentials.

Problem formulated for investigation

To determine the activities preparatory to efficient learning and to define efficient methods of performing such activities.

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3. Data Useful in Solving Problems

When the service problem has been formulated for study, the next step is to determine the types of data required. This decision is important. Not only must the data be as closely pertinent to the problem as possible but they must be representative enough to be reliable. Hence it is seldom possible to obtain too many data for a given problem. On the other hand, data may be collected indefinitely without finding a solution. It is not until the data are organized and interpreted that any useful conclusions result. Hence it is important to collect no more data than can be

collected and interpreted in the time available, and no more than are necessary. In selecting the types of data to be collected one must accordingly compromise between completeness and convenience. It is necessary to determine what types of data and how many data of each type are adequate.

When the problem has been properly stated, the first type of data to seek is at once apparent. Thus, if the problem is stated: "What methods may I use to interest my sixth grade class in a study of state history?", it is apparent that lists of methods to arouse interest in state history are data to be collected. On the other hand, *criteria* need to be collected also. The criteria are used to check the methods to determine their applicability to *my class in sixth grade history.* In deciding on the criteria to be collected, the teacher lists the factors which would affect the success of the methods in her class. In the preceding example, the abilities of pupils in the class, their interests, the time and facilities available, and other data represent criteria against which to check any methods collected.

The economy of the service study consists in the fact that data may be selected with exclusive reference to the needs of the particular class. In the illustration used, the teacher did not need to collect data regarding the interests of the class since she knew them to be substantially the same as those of other classes she had taught. Data regarding abilities of the pupils did need to be collected, however, since in this

class the abilities were below normal. Hence types of data owe their importance to the local conditions responsible for the problem and should be selected on that basis primarily.

Assumptions Involved in Selecting Data. — The data required for research upon a given problem could not safely be evaluated by the criteria just proposed for service study data. The reliability of data is the all-important consideration in research. Hence in a research to determine valid objectives for a given course, it would be unsafe to use the objectives found in professional literature, except perhaps to check the findings from data of other types. It would be necessary to determine the specific ways in which representative pupils have actually benefited by the course, whether in their later study or in their social and vocational pursuits. Such benefits might then be selected which are best adapted to the teaching facilities and other conditions of the course and accepted as objectives in the order of their importance.

It is by the use of assumptions, again, that this apparent conflict between the research and the service study point of view may be reconciled. By selecting data of any one type, the investigator necessarily assumes that the data are consistent with other types of data available. In terms of the previous illustration, one assumes that the objectives chosen from the literature will be consistent with the pupils' observable benefits from the course. This assumption may or

may not be valid. If the investigator is conscious of the assumption, however, he may test the assumption whenever he has occasion to question it. It is thus an important fact that in selecting certain types of data as desirable for a given service problem, the other types appearing on the master list must be assumed to be consistent with the type of data selected for examination.

In planning the types of data to be collected in the service study, it is desirable to know what types are pertinent to the given problem. The following master list contains the data pertinent to the service problems listed on the preceding pages; the data having been assembled by analyzing actual studies of the problems. From the master list one can check the items pertinent to any specific problem formulated.

A complete list of data pertinent to the investigation of all service problems would be so extensive as to afford little help in selecting the data needed for the investigation of any given problem. The following list thus contains only the items specified in the type procedures outlined in Chapters III to V for each of the ten typical service problems.

The scope of the data listed may be considerably increased by prefixing one or more of the following code terms to any appropriate item of the list.

CODE TERMS APPLICABLE TO ITEMS IN THE MASTER LIST OF DATA

a. Advice regarding.....
b. Causes of .....

c. Criteria for judgments regarding .....
d. Deficiencies in .....
e. Difficulties arising from.....
f. Judgments or criticism regarding .....
g. Methods of obtaining.....
h. Problems involved in.....

The code terms indicate the particular data required. For example, the investigation may collect *general aims of education* directly or may collect "advice regarding aims," "causes for particular aims," "criteria for aims," "deficiencies in regard to aims," and so on, for each of the items and each of the appropriate code terms.

Master List of Data

(Obtained by analysis of representative service studies)

1. Objectives
   a. General aims or values of education, of the given school, of the given subject, of the given grade.
   b. Mediate objectives of education, of the given school, of the given subject, of the given grade.
   c. Immediate outcomes of the given course or units of the course.
2. Environmental Conditions of Community and Home Life.
   a. Home and community conditions affecting pupils' progress in classwork.
   b. Dominant occupations and occupational interests.
   c. Vocational opportunities in community.
   d. Community interest in the school or department.
   e. Parents' attitudes, schooling, vocations, social status, and disciplinary methods.
   f. Leisure reading habits of parents and associates.

g. Forms of entertainment popular in the parents' social groups.
h. Physical facilities for home study.
i. Pupils' out-of-school activities and interests related to a given course.

3. Standard Conditions of Given School or School System.
   a. School board's rulings on given policies.
   b. Policies regarding school management.
   c. Policies regarding the scheduling of classes.
   d. Regulations regarding records and reports (pupils' marks, etc.).
   e. Methods of classroom supervision (teaching methods advocated, etc.).
   f. Administration of pupil case-study and guidance.
   g. Facts regarding age-grade distribution of pupils.
   h. Facilities for clerical help (in mimeographing, etc.).
   i. Funds available for teaching facilities.
4. Subject Matter.
   a. Textbooks or particular portions of textbooks, courses of study, and syllabi.
   b. Titles of units or major divisions of the given course.
   c. Topics or topical outlines of subject matter, basic principles, problems, etc.
   d. Supplementary material, *e.g.*, graded reading lists.
   e. Exercise materials and teachers' aids in directing individual study, oral exercises, etc.
   f. Illustrations of significant topics or points (specimens, anecdotes, vivid situations, exhibits, pictures, films, posters, diagrams, slides, etc.).
   g. Life situations or problems relating to the course and showing practical applications.
   h. Elements of subject matter graded for difficulty, importance, frequency, and other qualities.

i. Relationships among the several units composing the given course.
j. Vocabulary and technical terms required for efficient learning.
k. Basic learning activities, projects forming part of course of study.
l. Deficiencies in pupils' preparation for the course.
m. Published and unpublished tests.

5. Methods of Teaching and Pupil Direction.
   a. Methods and devices for presenting specified subject matter, illustrative devices.
   b. Methods and devices for diagnosing pupils' needs.
   c. Methods and devices for helping pupils to overcome typical difficulties.
   d. Methods and devices for teaching specified skills or activities.
   e. Methods and devices for testing and constructing tests.
   f. Methods and devices for organizing routines of class management.
   g. Principles involved in foregoing methods.
6. Classroom Activities.
   a. Pupils' learning activities capable of being observed.
   b. Pupils' learning activities inferred from classroom performances.
   c. Pupils' social activities in classroom.
   d. Teachers' classroom activities.
7. Psychological Factors in Pupils' Learning.
   a. Social and educational needs as indicated by desired outcomes, community surveys, etc.
   b. Needs of individual pupils for special treatment.
   c. Nature and success of individuals' previous schooling.
   d. Previous contacts with subject matter of the given course.

e. Dominant interests and aversions of individual pupils.
f. Vocational, scholastic, and social ambitions (intentions to complete course, etc.).
g. Interests in out-of-school matters related to the given course.
h. Interests in the course and particular divisions of the course.
i. Methods of study employed in the given course or grade.
j. Personal traits affecting ability and willingness to learn.
k. Attitudes toward classmates and other pupils.
l. Attitudes toward teachers' methods of teaching and class management.
m. Reactions to assignments and course of study material (textbooks, etc.).
n. Judgments regarding the importance and relative value of the given course or unit.
o. Reasons for electing the course.
p. Characteristics of social behavior on school premises.
q. Abilities of individuals or groups related to the given course or grade (silent reading abilities, etc.).
r. Achievements shown by classroom performances or by test scores.
s. Rates of speed in completing assignments of different types.
t. Difficulties in meeting the teacher's requirements (in dealing with prescribed materials, etc.).
u. Special abilities in extra-curricular activities.

8. Criteria for Pupils' Learning Activities.
   a. Test scores.
   b. Time records.

c. Rating scales.
d. Attention profiles.
e. Analyses of pupils' difficulties in learning.

9. Classroom Facilities.
   a. Conditions favorable to efficient learning.
   b. Obstacles to efficient learning.
   c. Time required for efficient teaching.
   d. Supplies and equipment required for efficient teaching.
   e. Space available for convenient and comfortable seating.

10. Psychological Factors in Teaching.
   a. Teachers' difficulties in attaining specified objectives.
   b. Teachers' possession or lack of essential personal traits.
   c. Teachers' command of subject matter.
   d. Teachers' difficulties in applying specific methods.
   e. Teachers' difficulties in adapting group methods to individual needs.
   f. Teachers' difficulties in making clear presentations and explanations.
   g. Teachers' difficulties in securing cooperation of class or individuals.

11. Methods of Investigation.
   a. Methods of collecting and selecting pupils' difficulties.
   b. Methods of planning and conducting classroom experiments.
   c. Methods of collecting and selecting criteria for results (constructing tests, obtaining age-grade norms, etc.).
   d. Methods of collecting and selecting subject matter.
   e. Methods of collecting and selecting teaching methods.

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4. Sources Containing the Data

The following master list of sources was prepared in the same way and is used for much the same purpose as the master list of data. In planning a service study the investigator should examine the list and note the various sources from which each desired type of data may be obtained. When the possible sources have been noted, they may be ranked in order of merit on the basis of three major criteria; namely, primacy, accessibility, and reliability.

A primary source is one from which the investigator may obtain the data himself without having to rely

on the reports of other investigators. In research studies, primary sources are to be selected in preference to secondary sources whenever possible. In service studies also the primary source is to be preferred, other things being equal. For example, in seeking the causes for pupils' failure in ninth grade algebra one might obtain the causes by testing, observing, and interviewing the pupils who fail in the particular course; or one might obtain a list of causes for failure from professional literature and select those which apparently apply to the given class. The former primary source is usually preferable to the latter secondary source.

But among the conditions that seldom are equal in any given study is the accessibility of the various possible sources. Some are always much easier to reach than others. Since economy of time and effort is an essential consideration in the service study, it follows that primary sources must often be passed by in favor of more accessible sources. By assuming that data obtainable from primary sources are consistent with the data actually obtained from more accessible secondary sources, the investigator saves much time and may later test the assumption if the validity of his findings is doubtful. The assumptions which it is necessary to make are thus often suggested by sources in the master list that are not utilized in the given service study.

Hence the third criterion mentioned, *reliability*, is the basis upon which one may compromise between

primacy and accessibility in selecting sources for a service study. A reliable source is one from which truly representative data may be obtained. That is to say, the data obtained from a given class regarding causes for failure in a particular course will be highly reliable for that class and course but highly unreliable for other classes or even for the same class in another course. Hence the service study owes much of its value to the fact that within the limits of the given classroom, reliable sources are so accessible.

In planning the selection of sources, the following steps are involved: (1) note from the master list the sources from which may be obtained each type of data desired. (2) Rank the sources separately for each distinct type of data according to primacy, accessibility, and reliability. This step is most readily applied by striking out the sources that are either too difficult to reach or too unreliable for safety, then in ranking the remaining sources according to primacy. (3) State the assumptions necessary to justify the sources selected, by listing the reliable sources that are not accessible. (4) Utilize the sources in the order of merit as shown by the ranks assigned.

Master List of Sources

(Obtained by analysis of representative service studies)

1. Pupils.
   - *a.* Members of the given class or grade.
   - *b.* Members of previous classes.

c. Members of school as a whole.
d. Former pupils engaged in particular occupations.
e. Pupils of corresponding course or grade in other schools.

2. Teachers.
   a. Other teachers of same subject or course.
   b. Other teachers of same grade or class.
   c. Teachers of same school.
   d. Teachers of same subjects and grades in other schools.
   e. Teachers of same course in other schools.
   f. Former teachers of a given class.
   g. Heads of departments concerned.
3. School Officials.
   a. Superintendent.
   b. Principal.
   c. Minor school officials.
      (1) Nurse.
      (2) Janitor.
      (3) Attendance officer.
      (4) Visiting teacher.
      (5) Home room teacher.
      (6) Clerk.
4. Authorities on Teaching.
   a. Classroom supervisors of regular or special subjects.
   b. Experts in teaching particular subjects in same or other schools.
   c. Authorities on methods of teaching particular subjects.
   d. Professors of education, educational psychology, principles of education, elementary education, secondary education.
   e. Specialists in methods of research.
      (1) Research bureaus of schools of education.
      (2) Research bureaus of city systems.

(3) Research bureaus of state departments and educational associations.
(4) U. S. Office of Education.

5. Community Members.
   a. Parents.
   b. Typical community members.
   c. Representatives of particular community groups.
      (1) Social groups.
      (2) Occupational groups.
6. Literature for Teachers.
   a. Literature on teachers' problems.
      (1) Books and magazines on special methods of teaching particular subjects.
      (2) Books and magazines on general principles of teaching elementary, junior high, or senior high school grades.
      (3) Books and magazines on principles of teaching.
      (4) Books and magazines devoted to typical problems of teaching and class management.
      (5) Manuals published by given department or school system.
      (6) Reports of teachers' committees and teachers' associations.
      (7) Standardized tests.
   b. Popular literature.
      (1) Magazine articles, novels, etc., containing illustrations useful in teaching.
      (2) Articles describing methods of dealing effectively with children of particular ages and types.
   c. Technical literature in other fields than education.
      (1) Pamphlets issued by commercial concerns and related to the particular course of study.
      (2) College textbooks in psychology, sociology, hygiene, etc.

(3) College textbooks in subjects taught in school.
(4) Writers' manuals containing directions for organizing material and presenting it effectively.

7. Literature for Pupils.
   a. School textbooks and courses of study.
      (1) Supplementary reading for courses.
      (2) Course outlines and syllabi.
      (3) Exercises, guide sheets, and laboratory manuals.
   b. Popular literature for pupils.
      (1) Books for leisure reading.
      (2) Juvenile magazines and other publications.
8. School Records.
   a. Attendance records.
   b. Health records.
   c. Scholastic records.
   d. Behavior records.
   e. Case histories of problem pupils.
   f. Mental test records.
   g. Records of class assignments and material taught by previous teachers of the given course or grade.
9. Bibliographies.
   a. Bibliographies on special phases of teaching and class management.
   b. Bibliographies on methods and findings of research.
   c. Bibliographies on various phases of the subjects taught.
   d. Library catalogs.
   e. Publishers' catalogs.
   f. School supply house catalogs.
   g. Bibliographies of standardized tests and teachers' aids.
10. Educational Research Studies.
   a. School surveys.
   b. Community surveys.

c. Studies to define principles involved in typical classroom problems.
d. Studies to collect basic data for curriculum construction.
e. Studies to organize available data into school courses or units of school courses.
f. Studies to define efficient methods of teaching specified materials.
g. Studies to define principles of learning.
h. Studies to define research methods applicable to teaching problems.
i. Social case work studies.

11. Local Environment.
a. Museums.
b. Industrial plants.
c. Commercial houses.
d. Laboratories.
e. Other places in the locality from which useful data may be obtained.

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5. Techniques by Which Data Are Obtained From the Sources

The master list of techniques presents methods of obtaining the desired data from the sources chosen. In planning the service study, the investigator must select and formulate techniques of two kinds; first, the techniques required to collect data from the sources, and second, the techniques by which to organize and interpret the data collected.

The essential criteria for selection of appropriate techniques are three: namely, reliability, practicability, and adequacy. A technique is reliable when it can be depended upon to obtain the facts desired and to obtain them with small likelihood of error. A technique is practicable when its use involves no more time, expense, nor skill than the investigator has at his command. A technique is adequate for a given purpose when it serves to obtain or interpret a sufficient amount of the desired data with a sufficiently small probable error and when it is also readily applied by the given investigator. Hence adequacy involves the two other criteria. The adequacy with which techniques are planned for a given study also involves the variety of techniques employed to obtain data from a given source. One technique is seldom sufficient when completeness of data is important. To obtain a complete list of causes for pupils' failures, for example, it would probably not prove adequate to collect the

causes by interviewing the individual pupils concerned, though this is probably the best single technique. It would be desirable also to analyze the literature on causes for failure, interview other teachers of the subject, apply diagnostic tests to representative classes, and submit a master list of the causes to authorities for their criticism and addition of other causes.

The same importance attaches to the assumptions made in selecting techniques that has been emphasized in connection with formulating the problem, deciding what types of data are needed, and choosing the sources from which to obtain the data. The other techniques appearing on the master list suggest the assumptions needed to justify the techniques selected. That is to say, when the investigator has decided what technique he will use of those that might be used, the remaining techniques must be assumed to be equivalent. Thus whenever the reliability of a particular technique is called into question, the assumptions regarding other techniques may be tested for further evidence. Such assumptions regarding the equivalence of other techniques that are pertinent but not utilized, serve to justify the use of the techniques most readily applied and thereby make for the greater economy of the service study as compared with the research.

In planning the selection of techniques for a service study the following steps are essential (1) note the techniques of the master list that are reliable when applied to the sources chosen, taking the sources one

at a time. (2) Select the techniques that are readily applied under the conditions of the investigation. (3) State the assumptions implied by the reliable techniques not utilized. (4) Repeat each of the foregoing steps in selecting techniques for the organization and interpretation of data, this time listing the techniques separately for each type of data required.

Master List of Techniques[1]

For Collecting, Organizing and Interpreting Data

(Obtained by analysis of representative service studies)

1. Analysis.
   - *a.* Unsystematic — implications of data set down without definite procedure.
   - *b.* Systematic — implications of data derived by some specified criteria or system.
   - *c.* Standardized — implications of data derived by valid criteria until no new implications are obtained from any available source.
   - *d.* Statistical — implications derived by procedures to determine distribution and central tendencies.
2. Reading.
   - *a.* Unsystematic — items selected arbitrarily.
   - *b.* Systematic analysis — items selected by specified but subjective criteria.
   - *c.* Standardized analysis — all items selected which meet objective criteria.
3. Observation.
   - *a.* Unstandardized — notes made arbitrarily.
   - *b.* Standardized — complete stenographic record or photographs or both.

[1] See Chapter VI for a more detailed description of each technique.

4. Personal Interview and Group Conference.
   a. Casual — questions not prepared, answers not recorded.
   b. Systematic — questions prepared, selected answers noted.
   c. Standardized — questions determined by previous experiment, complete stenographic record of answers.
5. Written Statement.
   a. Unstandardized record — items listed arbitrarily at irregular times.
   b. Standardized record — items listed under prepared headings at regular times.
6. Check-list.
   a. Unstandardized — items listed arbitrarily to be supplemented by other items supplied by other persons.
   b. Standardized — master list of items previously checked for completeness to be evaluated by a selected jury.
7. Sampling.
   a. Unsystematic — items selected arbitrarily from sources.
   b. Systematic — items selected according to objective criteria.
8. Classification.
   a. Rough — arbitrary selection of overlapping headings to organize data.
   b. Logical — discreet headings determined and checked by synthetic judgment or by consensus of qualified judges.
   c. Mechanical — headings determined by objective criteria as in tabulation of statistical data.
9. Summarizing.
   a. Unsystematic — items selected arbitrarily.
   b. Systematic — items selected by specified criteria.

10. Individual Judgment.
    a. Unsystematic — judgments not controlled.
    b. Systematic — judgments controlled by specified criteria or "standardized" rating scales.
11. Group Rating.
    a. Summary of unsystematic judgments.
    b. Summary of systematic judgments which are controlled by specified criteria or "standardized" rating scales.
    c. Statistical treatment of judgments.
12. Comparison.
    a. Unsystematic — resemblances and contrasts noted by inspection.
    b. Systematic — cross-checking of two or more master lists containing discreet items.
    c. Statistical — correlations to determine degree of relationship and variation.
13. Space and Frequency Counts.
    a. Unweighted counts.
    b. Weighted counts.
14. Experiment.
    a. Uncontrolled — results recorded as estimated by the investigator.
    b. Controlled — results checked for reliability and validity.
    c. Standardized — variable factors eliminated except the factors under experiment, results checked and objectively recorded.
15. Testing
    a. Unstandardized — validity and reliability of test not known.

b. Standardized — validity and reliability established by previous experiment.

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6. Use of the Text in Planning Service Studies

When this book is used as a text for extension and summer school classes composed of teachers in service or as a manual for the professional meetings of teachers and supervisors in a given school system, it has been found helpful to employ some such plan as the following.

The first two chapters are studied to determine the possibilities and limitations of investigations by teachers in service and to define steps necessary in planning and conducting a systematic study of teaching problems. At this point, a collection is begun of the significant teaching problems of the given group. After such problems are defined, they are classified with reference to the type problems involved. Then Chapter III, "Service Problems Involving the Curriculum," is studied in an attempt to determine the general plan for investigating curriculum problems and to define definite plans for studying the specific problems of the group. Where techniques are required that are not known to the readers, reference is made to Chapter VI for descriptions, and to the specimen studies for illustrations. After a plan of investigation is developed, the group will use the plan in conducting the investigation. Chapters IV and V may be utilized in similar fashion for the study of other problems.

For the preliminary training of graduate students in

research methods, Chapters I and II may be studied to define the research study and to become familiar with its structure. Chapters III, IV, and V will help to define certain types of problems needing investigation, to outline methods of attack, and provide sufficient illustrative studies to become familiar with certain uses of the more simple research techniques. Chapter VI will serve to describe the techniques. This may be supplemented by practice in utilizing these methods of research and may be followed by examinations of reports of typical research studies, to define the more complex research procedures.

The individual student of research may obtain a list of research problems by considering each type of data in relation to the type problems. Types of data not yet related to a given problem must be assumed to be consistent with the findings of previous studies. Such assumptions represent research problems in need of investigation. Furthermore, a comparison of the techniques described in Chapter VI with the techniques known to the research student will help to suggest certain other research techniques which might well be adapted to the use of teachers in service.

Finally, the individual teacher, supervisor, or principal in service may utilize the book as a manual for investigating perplexing problems which arise. Chapters I and II should help in defining the problem clearly; a study of the appropriate type problem in Chapter III, IV, or V will help in formulating a plan of attack;

while Chapter VI will be useful in describing methods he may wish to use in an investigation with which he is unfamiliar. The specimen studies will serve to illustrate and clarify both the plan of attack and the techniques of investigation.

The following outline indicates the natural order in which the various types of material may be used in planning a given service study:

a. Examine the Table of Contents and select the section concerned with the type problem most similar to the problem requiring investigation.

b. Read the section throughout and note the respects in which the "type procedure" needs to be modified to fit the problem as stated in terms of local conditions. Note the steps in the procedure that can be applied to the given problem.

c. Examine the "type study" following the "type procedure" and note the examples of each step noted as appropriate in investigating the actual problem.

d. Examine the "specimen service studies" for the further examples and illustrations needed to explain and illustrate the steps selected.

e. Examine the "tabular analysis" at the close of the section and note the types of data, sources, and techniques required by each of the selected steps.

f. Examine the master list of data and the master list of sources in Chapter II for help in defining the desired data and appropriate sources in greater detail.

g. From the Table of Contents, locate the descrip-

tion of the appropriate techniques in Chapter VI and study them carefully.

h. Outline the plan of the study in detail. Then proceed to apply it, referring to the specimen studies for help in cases of difficulty.

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CHAPTER III

PROBLEMS INVOLVING THE CURRICULUM

1. Summary

"The curriculum" is a name for what is taught in one or more courses. A curriculum, properly so-called, is thus the concern of the superintendent or principal who determines the emphasis to be given to different branches of instruction, with or without expert help.

The methods employed by administrators in the construction of curricula range all the way from no methods at all to the methods of laboratory research. It is only when a new school is opened, perhaps, that the curriculum can be constructed with regard *only* to the needs of the pupils enrolled. Where this opportunity exists, it is commonly not realized, — either for lack of the research facilities necessary to define the needs and work out appropriate materials or because it is so much easier to take over ready-made curricula of the traditional sort. Taking the country over, the school systems like Denver, St. Louis, and Winnetka which have seriously undertaken to study and apply systematic methods of curriculum construction represent a very small but very significant minority.

Speaking generally, the prevailing practices of curriculum construction in the public schools are two. The most significant is properly called research. Curriculum research is confined to small areas of certain fields in which objective criteria have been developed for the evaluation of subject matter with reference to social needs. Such research is at present most productive in fields like spelling and arithmetic where the items of subject matter to be taught may be selected with reference to the frequency and importance of their use in life situations and with regard to the relative difficulty of learning the items when they are not taught in school. Because of the technical character of these studies, they are properly undertaken only by specialists in the given field. Research studies are seldom directly useful to teachers therefore, except as the findings are developed in textbooks or when the teachers use the findings to improve a given course of study. The important fact for the reader of this book is that the curriculum problems confronting administrators and teachers in service cannot be efficiently attacked by the objective methods employed by the research specialist, except as the actual problem is reduced to specific elements which may be studied separately over a period of years.

A second type of curriculum construction is commonly undertaken by committees of teachers who work under the direction of the superintendent or of a specialist called in to organize the investigation. Such

investigations sometimes have as their real purpose and motive the training of teachers; the ostensible purpose of developing a satisfactory curriculum is subordinate and consequently seldom accomplished. It would probably be wiser in such cases to set about each purpose separately. This could be done by engaging a competent authority to direct the teachers in whatever service studies are likely to solve the immediate problems of the classroom and to acquaint them with the essential principles underlying the construction of curricula. The actual planning of the courses for each grade and department might then be delegated to experts in each field with sufficient funds to pay for the merely clerical labor that is usually done by teachers when the committee plan is adopted.

While the foregoing suggestion may appear to be extreme and unduly critical of a practice which at present writing is much in vogue, the writers believe that nothing less is justified by the facts. The published courses of study developed by teachers' committees of large city systems are in many cases an improvement upon the courses they replace. There is every reason to suppose, however, that better courses could have been constructed by a staff of full-time specialists, if one compares such courses of study with the textbooks and syllabi written on the basis of research findings.[1] It would usually be more economical

[1] For example, the Rugg Social Science Monographs, the Breslich Mathematics texts, the Horn-Ashbaugh Speller.

to engage a staff of specialists than to take the time of teachers for work in which all but a few are novices. It is also certainly more efficient to delegate the work of analyzing and prescribing for the social and vocational needs of the school population to experts in this particular field, thus reserving to teachers the equally difficult and important task of adapting the resulting courses of study to the specific needs of individual pupils.

In both of the foregoing procedures the teacher must bear responsibility for the subject matter of the courses taught in so far as he decides upon the specific outcomes desired. Hence no matter how carefully the administrator has prepared the course of study in advance, a service study may well be required to define specific objectives for the given class. It is to this type of study that the present section is devoted; namely, studies undertaken by the classroom teacher to define objectives more "teachable" and more valuable to a given class. The character of such studies may be indicated by describing the major types of problem involved, the assumptions required, and the general plan of attack most useful to the individual student, supervisor, or teacher. More specific description of the methods involved are presented in the following sections which discuss each type of problem separately.

Typical Service Problems. — Service problems relating to the curriculum classify readily under four

types. The types are distinguished both by logical stages of development and by different degrees of complexity. As discussed in the following sections of this chapter, the four type-problems involve defining objectives, constructing or reorganizing a course of study, selecting textbooks, and adapting prescribed materials to a given class.

The first two problems — defining objectives and constructing a course of study — are obviously too large for any single teacher in service to undertake if applied to the course as a whole. To define objectives adequately one must record the social needs of the school community in some detail, set up criteria by which to evaluate the needs, and define the major objectives in terms of the needs that the school must meet. So defined, the objectives are of little use to the teacher until each objective has been analyzed into the more specific outcomes of class instruction which the classroom teacher is expected to produce. While no one student can carry out such a study single-handed, it is possible to define specific objectives for a small part of one course. When the problem of defining objectives is approached from the standpoint of the subject matter taught, the amount of subject matter covered determines the scope and therefore the practicability of the study.

The problem of constructing or reorganizing a course logically follows the definition of objectives and is equally comprehensive. To construct a new course of

study from primary sources alone is a research of great magnitude. The service study approach, however, is based on the assumption that existing courses may be found which square with the objectives closely enough to make the problem one of selecting the major divisions or units of the course and then selecting from secondary sources the best available content for each unit.

The last two of the type problems fall definitely within the field of the service study, since both are met by the great majority of teachers in service and both are solved to better advantage with reference to a given class than with reference to classes in general. The efficient selection of textbooks becomes entirely practicable when the facts have been collected that are needed to show what criteria are most important in selecting text materials for the particular pupils concerned. The problem of adapting prescribed materials to a given class is very similar. No satisfactory adaptations can be made except when data have been collected to show what adaptations are needed and by what proportion of the given class. Such data are readily obtainable from any class by service study techniques.

Assumptions. — The fact has been mentioned repeatedly that the service study as compared with the research owes its greater simplicity to its greater dependence upon assumptions. This fact is clearly illustrated by a comparison of the foregoing problems. It

is plain that no one of them can be solved without the aid of unverified assumptions. To select for study the problem of constructing a new course, for example, involves the assumption that satisfactory objectives have been defined.

The reader may infer that the interrelation of several problems does not require the investigation of all problems so interrelated. It is entirely legitimate for purposes of the service study to investigate the most significant problem separately, provided that assumptions regarding the remaining problems of the group are explicitly stated. By this means the problem for study is brought within reach and the other problems involved are defined for study at some later time or by some other student. The four problems to be discussed in the present chapter are stated in what is normally the order of *de*creasing importance for the specialist and the order of *in*creasing importance for the teacher.

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2. Defining Objectives

(Type Problem I-A)

It is desirable to define objectives for any course of instruction because well-defined objectives offer a basis upon which to decide what to teach and how to teach it. Whether a statement of objectives does or does not serve this purpose depends upon whether the objectives are capable of progressive analysis through the stages intervening between the ultimate objectives, which are very general, to the immediate activities of the classroom, which are very specific. In the following discussion of objectives it will be convenient to designate these progressively specific aims as "objectives," "desired outcomes," and "classroom activities." Thus, "objectives" are the least specific and "classroom activities" are the most specific.

Methods of defining objectives are essentially two, whether one employs intensive researches or the simpler procedures of the service study. The methods are sufficiently distinguished as deductive and inductive methods. The deductive method selects from the objectives proposed by authorities and reduces them by analysis to specific objectives appropriate to the given course. The inductive method derives the objectives from a classification of the specific activities performed by the pupil in the classroom or by adults in real life.

While there are occasions that justify the use of

either method alone, the use of both methods in combination is usually preferable. When only the deductive method is used, there is the danger that the objectives proposed by authorities may be so general and abstract that the teacher fails to relate them to specific items of subject matter and teaching method. Unless each objective is analyzed into specific outcomes and each outcome is analyzed into the actual materials and exercises used to produce it, a statement of objectives is of very little use. The relationship of general aims to the specific classroom activities contributing to their attainment should be continuous through the intervening steps, as in the following illustration from a course in community civics.

In this illustration, of course, only one of several items is shown on each level to illustrate the continuous relationship from the general aim to the learning exercise. The complete outline shows the same relationship for *all* aims, objectives, outcomes, and exercises.

I. To teach pupils to meet successfully certain definite social responsibilities such as civic responsibilities, domestic responsibilities, community responsibilities, and the like (general aim).
   A. To teach knowledge which is useful in controlling community situations of everyday life (course objective).
      1. To teach facts regarding the need for protection of life and property by the community, (unit objective).

a. To convince pupils that the community suffers tremendous loss from fire, accidents, natural disasters, and crime (specific outcome).

(1) To direct pupils in working a specific exercise (learning activities leading to specific outcome desired).

The inductive method is also likely to be inadequate when applied alone unless the resulting objectives are checked against the objectives proposed by authorities. Just as the deductive method alone usually fails to produce objectives that are specific enough to be used as criteria in selecting subject matter and learning activities, so the inductive method alone seldom produces objectives general enough to indicate the important social values to be developed by the course or curriculum as a whole. To derive objectives inductively it is necessary to carry the classification of specific classroom activities or other data through increasingly general headings until the headings become sufficiently general to apply to *any* course.

The following illustration is taken from a study in which objectives for a course in ninth grade mathematics were derived inductively.

I. Working problems involving temperature readings (specific pupil activity).

A. Applying rules to problems and life activities (typical pupil activity).

1. To teach pupils to understand the meaning and use of positive and negative numbers as applied

to the thermometer scale, angles, segments, business terms, and other practical uses (unit objective).

a. To develop understanding and skill in the use of fundamental operations in algebra (course objective).

(1) To teach the information and skill required for further study in the given subject with a view to meeting vocational needs (general aim).

Since the examples used for illustration show the desired continuous sequence of steps between the very general and the very specific items, they do not exemplify the difficulties presented by the use of either the inductive or the deductive method alone. It is perhaps sufficiently obvious, however, that in conducting a service study it would be a mistake not to utilize the general aims and course objectives that are available in textbooks on the teaching of the various subjects and grades. It is also evident that the specific activities of pupils should be recorded since they indicate what is actually done to attain the more general objectives and since they can be recorded easily by observation. In planning a study to define objectives, the course objectives and the activities should therefore be collected first.

Problems. — All service studies involve the definition of objectives to some extent. There are rare cases in which an administrator, department head, or

committee of teachers has conducted a local investigation whereby the objectives of the school, department, or course have been defined to the complete satisfaction of all concerned. In such cases the objectives may be accepted as a basis for the solution of service problems that are met in attempting to attain the objectives. Yet where objectives as described in the foregoing paragraphs have not been defined in terms of the local situation, it is invariably well to define them before investigating any other problem shown in the master list. The objectives to be attained constitute, in the large majority of cases, the most satisfactory criteria for the selection of teaching methods.

Assumptions. — The definition of objectives that are socially adequate as well as readily attainable under the given conditions demands the judgment of the wisest philosopher, or group of philosophers, applied to all the facts that relate to the educational factors involved. It is thus evident that a completely satisfactory statement of objectives for any course of instruction is always far to seek and probably never to be found in any human society whose ideals are not completely static. The most that can reasonably be expected is a statement of objectives that shall approximate the best judgment of the best minds available in the community and in the profession at large.

Yet it is a large undertaking to secure the best judgment of the best minds upon any problem that does not involve the immediate personal welfare of the

individual judges. The problem of stating the objectives of public-school work is a matter with which only a few students of education are deeply and genuinely concerned. It is thus necessary for the individual investigator to rely upon the best judgments he can secure, even though such judgments are admittedly tentative. Provided the investigator states the assumptions that are needed to justify the objectives named, he may utilize the tentative judgments until he or others may test the assumptions. Some of the more significant assumptions that are needed to justify the procedure herein proposed for the definition of objectives, are stated in the following paragraphs.

1. It must generally be assumed that certain of the general aims and objectives proposed by recognized authorities for a given department or grade are desirable for a given community, even though the authorities in question are unfamiliar with the local conditions.

2. When a list of objectives is submitted for evaluation to local groups of community members, parents, school officials, or teachers, it must be assumed that judgments made by these groups regarding the relative importance of the objectives are based upon facts with which each group is familiar.

3. It must further be assumed that having identified the more specific objectives or desired outcomes, the investigator is qualified to relate them to the more general objectives; and further that the investigator

can distinguish general objectives that do not apply to the desired outcomes, and vice versa.

4. Finally it is assumed that having prepared a tentative statement of objectives, the teachers concerned are able and willing to improve them by collecting evidence from their pupils regarding the completeness and relative value of the desired outcomes stated.

Type Procedure. — The following outline is presented to show the steps in a service study to define objectives for a given course. The outline should serve also to emphasize the importance of combining inductive with deductive methods of defining objectives. While the outline must be adapted to the specific conditions of any particular problem studied, certain of the steps will be found useful in studying any problem of this type. The steps marked "optional" may more safely be omitted when time does not permit the application of each step.

The Problem: To collect the specific outcomes desired for a given course with reference to (a) the objectives proposed by authorities in their writings; (b) the subject matter and learning exercises of the course; and (c) the social, vocational, and personal needs of a typical class in the given community. (For subproblems see the master list of Chapter II, section 2.)

Abstract of Procedure: 1. Collect objectives proposed by authorities for the given subject, course, or grade as found in books and articles in periodical literature. Copy objectives considered appropriate for the course

on a separate card. Record all objectives found, regardless of how general or how specific each may be. Then classify the cards by placing the more specific objectives under the more general. (See Specimen Studies No. 1, Step 2; No. 4, Step 1; No. 5, Step 3; No. 8, Step, 1; No. 9, Step 1.)

2. Go over the course of study in detail and list the specific activities which pupils must carry on in learning the subject matter. Add such other activities as can be obtained by observing pupils at work in the classroom. Write each activity on a separate card or slip and classify as before. (See Specimen Studies No. 1, Step 1; No. 2, Steps 1, 2, 3; No. 3, Steps 1, 2, 3; No. 8, Step 2; No. 9, Steps 1, 5, 6.)

3. Go over a typical class roll containing the pupils' names together with such other information as may be recorded, such as parent's occupations, addresses, size of family, et al. With reference to these present and future community activities, and available information regarding pupil's interests and abilities, list the ways in which the given course is likely to prove most useful to each pupil or each type of pupil — for example, "to prepare for later study of the subject," and the like. Classify such life applications of the course separately as before. (See Specimen Studies, No. 1, Step 1; No. 3, Steps 1, 2, 3; No. 5, Step 4; No. 6, Steps 1, 2, 3, 4; No. 7, Steps 1, 2, 3, 4, 5; No. 8, Step 2; No. 9, Steps 2, 3.)

3a. (Optional.) Submit the first list (of objectives

taken from the literature) to other teachers of the subject who are acquainted with the given school and ask them to indicate the most important objectives and the objectives that are considered impracticable (by marking the most important 3, the impracticable ones 1, and the other items on the list 2). Summarize the ratings and score the items accordingly. (See Specimen Studies, No. 1, Steps 7, 8; No. 4, Step 2; No. 9, Steps 1, 5, 6.)

3b. (Optional.) Submit the second list (of pupils' activities) to teachers in the same way and obtain similar ratings. Score as before. (See Specimen Study No. 1, Steps 3, 4, 5, 6.)

3c. (Optional.) Submit the third list (of life applications) to teachers and to persons of good judgment in the community and obtain similar ratings. Score as before. (See Specimen Studies, No. 1, Steps 3, 4, 5, 6; No. 9, Steps 2, 3, 6.)

3d. (Optional.) Check the first list against the second by selecting the objectives from the first list that have the higher scores and which are clearly related to the items of the second list that are given higher scores. The objectives so selected should be regarded as valid objectives for the course when they are related to important life applications of the subject and when they are related to the pupils' classroom activities by a series of intervening objectives. (See Specimen Studies, No. 1, Step 9; No. 9, Steps 1, 3, 4, 5, 7.)

4. If the foregoing step is omitted, check the objectives against the pupils' learning activities by classifying each activity under the desired outcome or objective to which it leads. Then note the objectives not related to any activities and the activities not related to any objectives. (See Specimen Studies, No. 8, Steps 4, 5; No. 9, Steps 1, 3, 4, 5, 7.)

5. Improve the selection of objectives wherever possible by adding others that are needed to cover the specific activities not related to any of the objectives as first listed; also by omitting any objectives that cannot be attained under the best teaching conditions in the given school; also by adding activities needed to attain the objectives for which no activities are listed. (See Specimen Studies, No. 4, Steps 3, 4, 5; No. 9, Steps 6, 7.)

6. Classify the material in a logical order with at least three levels of subordination clearly defined; namely, the objective of the course, the specific outcomes of each typical unit or type of subject matter, and the pupils' activities or methods of learning that lead to each specific outcome. So organized the objectives are defined in a manner which renders them useful as criteria in selecting both subject matter and methods of teaching. (See Specimen Study, No. 3, Step 3.)

Type Study. — Like the type studies contained in each of the other sections, the following type study[1] is intended to illustrate the more essential steps in the

[1] From *The Teaching Unit; A Type Study*, Douglas Waples and C. A. Stone, D. Appleton & Co., 1929.

foregoing abstract of procedure. For illustrations of general techniques involved in the procedure that are not illustrated, see the Table of Contents, Chapter VI, "General Techniques."

Problem: To prepare a statement of related general aims, objectives, desired outcomes, and pupil activities with reference to the course in eighth grade mathematics and with particular reference to the unit of positive and negative numbers. (The one unit is chosen to simplify the illustration. The same procedure might be applied to the entire course.)

Assumptions: a. That the general aims and objectives as stated for eighth grade mathematics in the Report on Junior High-School Mathematics (*North Central Association Quarterly*, March 1928, pp. 396 ff.), are satisfactory when applied to the classes for which the statement of objectives is desired.

b. That the statement of ways in which the course is likely to prove most useful to the pupils, as contained in the report mentioned, is adequate.

c. That the list of pupils' activities in learning the given unit is sufficiently complete, even though it was prepared by analyzing only the pupils enrolled in the courses concerned (three classes).

Procedure: (See the foregoing Abstract of Procedure for complete list of steps.)

Step 1

"Collect specific objectives and classify them under general headings."

The following objectives obtained from the N. C. A. report mentioned will indicate the nature of the general social objectives:

I. The Vocational Objective
   A. Acquiring fruitful knowledge
      1. Preparatory to acquiring other knowledge
      2. Knowledge which functions directly in developing dispositions and in discovering and developing abilities
      3. Knowledge which is useful in the control of situations in everyday life
   B. Development of attitudes, interests, motives, ideals, and appreciations
   C. Developing mental techniques
   D. Developing right habits of conduct and useful skills of living

II. Leisure time objective
   (Sub-topics same as for the vocational objective)

III. The social objective
   (Sub-topics same as for the vocational objective)

IV. The Health objective
   (Sub-topics same as for the vocational objective)

Step 2

"Collect specific classroom activities and classify under specific objectives."

The following examples show a few of the activities collected by observing pupils while studying the unit of positive and negative numbers. Following the

activities themselves is a list of the headings under which the activities were later classified. The headings represent actual outcomes of the unit.[1]

C. Pupils' learning activities as observed

1. Activities involving speech
   - *a.* Stating meaning of positive and negative numbers
   - *b.* Giving historical sketch of development of the number system
   - *c.* Demonstrating and explaining problems
     etc.
2. Activities involving observation
   - *a.* Examining the mercury thermometer
   - *b.* Reading a thermograph
   - *c.* Examining stock reports
     etc.
3. Manual activities
   - *a.* Graphing a table of readings from the thermometer
   - *b.* Constructing other graphs and figures
   - *c.* Making diagrams from tables to indicate mountains and valleys
     etc.
4. Activities involving listening
   - *a.* Listening to teacher's directions regarding new work
   - *b.* Attending to teacher's explanations regarding special problems
   - *c.* Following teacher's suggestions regarding supplementary work
     etc.

[1] Adapted from *The Teaching Unit; A Type Study*, Waples and Stone, D. Appleton, 1929, Chapter II.

D. Pupils activities as inferred from activities observed

1. Inducing rules
   a. Inducing rule for graphical addition of signed numbers
   b. Making mental picture of graphical addition
   c. Adding by rule
   etc.
2. Applying fundamental processes and principles
   a. Combining similar terms
   b. Using addition in solving equations
   c. Adding terms of polynomials without parentheses
   etc.
3. Applying rules to problems in life situations
   a. Working problems involving temperature readings
   b. Working problems relating to directions
   c. Locating objects and places in geography, astronomy, and navigation by directed angles
   etc.
4. Applying problem-solving processes
   a. Thinking reflectively
   b. Generalizing
   c. Knowing relationships between different elements of the problem
   etc.

The foregoing activities were classified under the following thirty headings[1]; the headings thus representing generalized activities or outcomes.

1. To understand the practical uses of signed numbers.
2. To extend the number system.

[1] Quoted from *The Teaching Unit,* Douglas Waples and C. A. Stone, pp. 41 ff., by permission of the publishers, D. Appleton and Co.

3. To develop personal traits as in any other subject, such as appreciation, judgment, self-confidence, and honesty.

4. To add numbers graphically and by rule.

5. To add, subtract, multiply, and divide signed numbers with accuracy and a fair degree of speed.

6. To understand business practices that involve the principle.

7. To distinguish between plus and minus signs as signs of quality and signs of operation.

8. To solve any equation of the form $5x-3=-7$ where any positive or negative number may be taken as a coefficient.

9. To add polynomials involving signed numbers.

10. To subtract polynomials involving signed numbers.

11. To multiply polynomials involving signed numbers.

12. To divide polynomials involving signed numbers.

13. To appreciate the use of directed numbers in connection with formulas, thus extending their use.

14. To understand the connection between directed numbers and the co-ordinate system.

15. To evaluate expressions such as $x^3-5x^2+2x=-3$, and $\sqrt[3]{8-(919)}$.

16. To factor expressions involving positive and negative numbers.

17. To solve problems involving signed numbers.

18. To remove parentheses and insert quantities in parentheses where directed numbers are used.

19. To solve equations containing two unknowns involving positive and negative numbers.

20. To develop reflective thinking in terms of mathematical concepts and relationships.

21. To develop the ability to recognize mathematical concepts and relationships.

22. To develop habits of verification as based on checking of solutions.

23. To develop adequate skill in selecting and applying mathematical processes to actual problems with speed and accuracy.

24. To develop a critical attitude toward mathematical processes as applied to given situations.

25. To develop the ability to interpret results.

26. To use inequalities involving positive and negative numbers.

27. To manipulate fractions involving positive and negative numbers.

28. To develop the ability to find the product of and to square binomials.

29. To cooperate with teacher and classmates in the study of the unit.

30. To provide necessary facilities for class work.

Step 3

"List useful applications of the course, as suggested by facts about individual pupils."

The following nineteen applications were selected from Schorling's list of objectives[1] as being important to the pupils concerned and readily taught in terms of the unit of positive and negative numbers.

1. Knowing how to use positive and negative numbers as they occur in ordinary affairs of life.

2. Knowing that things in life, especially mathematical quantities, are often so related that they change together.

[1] Raleigh Schorling, *A Tentative List of Objectives in the Teaching of Junior High School Mathematics*. Geo. Wahr, Ann Arbor, Mich., 1925.

3. Knowing how to use various methods to show how numbers change together, such as simple tables, arithmetical rules, formulae, statistical graphs.

4. Knowing that word statements showing the relationships of numbers may be abbreviated as equations.

5. Knowing that some methods are more effective in problem solving than others.

6. Knowing how people pay for the use of money (interest).

7. Knowing how to save money.

8. Understanding the idea of relationship or dependence.

9. Knowing how to balance a savings account.

10. Knowing how to read meters.

11. Giving clear illustrations of each of the following terms: angles of elevation and depression, horizontal and vertical scales of a graph, negative numbers, positive numbers, similar triangles, axiom, equation, formula, curve, statistical table, ratio, proportion, scale drawing, tangent, square root.

12. Locating a point with reference to two axes, finding the zero of a scale, making common sense approximations in computation.

13. Assuming responsibility for correct results.

14. Analyzing a complex situation into simpler parts.

15. Inspecting data in an effort to find relationships.

16. Appreciating the fact that progress in the business world depends in part upon the wide use of mathematics.

17. Seeking truth through the habit of checking hypotheses and solutions tentatively described.

18. Discussing problems precisely, clearly, and completely.

19. Knowing enough about negative numbers to understand common references in general reading.

Step 3b

"Obtain teachers ratings on pupil activities."

The following table[1] shows the ratings given by 25 classroom teachers and by 34 experts in the teaching of junior-high-school mathematics to the 30 outcomes shown in connection with Step 2. The ratings are shown for only 21 headings because the judges indicated that 9 of the headings were as pertinent to other units as to the unit of positive and negative numbers.

DISPLACEMENTS BETWEEN RANKS BASED ON RETURNS FROM TEACHERS AND FROM AUTHORITIES

OUTCOME	RANK BY EXPERTS	RANK BY INSTRUCTORS	DISPLACEMENT
1	1	1	0
2	4	3	1
3	7½	10	2½
4	3	2	1
5	20	17	3
6	16	5	11
7	2	4	2
8	14	9	5
9	14	11	3
10	14	13	1
11	18½	14	4½
12	10	6½	3½
13	7½	8	1½
14	6	6½	½
15	17	19	1
16	5	12	7
17	12	15	3
18	9	16	7
19	21	20½	½
20	18½	18	½
21	11	20½	9½

[1] Waples and Stone, *op. cit.*, p. 44; quoted by permission of D. Appleton and Co.

Steps 4 and 5

"Check objectives against pupils' learning activities."

The following general objectives are those under which none of the pupils' activities in connection with the unit were found to classify.

I. Leisure time objective
  A. Acquiring fruitful knowledge
    1. Preparatory to acquiring other knowledge
    2. Knowledge which functions directly in developing dispositions and in discovering and developing abilities
  B. Acquiring right habits of conduct and useful skills in living
IV. Health objectives
  (entire)

It should be noted that the foregoing objectives were omitted as not particularly appropriate to the unit of positive and negative numbers. They might doubtless be retained as objectives for other units in the course in eighth-grade mathematics.

The following pupil activities were added to those originally collected. The activities added were suggested by other objectives under which no activities had been classified.

1. Keeping a personal expense account to emphasize the value of thrift.
2. Listing on paper the important steps to be taken in solving a given problem.
3. Estimating the answers to all problems to be com-

puted as a means of controlling the method of making the computation.

4. Describing the data given in the problem before stating the steps to be taken in solving it.

5. Solving mathematical puzzles as a means of learning the recreational possibilities of mathematics.

Step 6

"Classify material in at least three levels of subordination."

The following extract shows how the general objectives were progressively related to the specific pupil activities — *i.e.* how the objectives, applications, desired outcomes, and activities were combined in one outline.

I. The Vocational Objective
  A. Acquiring fruitful knowledge
    1. Preparatory to acquiring other knowledge
      a. Knowledge of uses of positive and negative numbers as they occur in the ordinary affairs of life.
        (1) Activities involving speech
          (*a*) Stating the meaning of positive and negative numbers
        (2) Activities involving observation
          (*a*) Examining mercury thermometer
          (*b*) Reading a thermograph
          (*c*) Examining stock report
          (*d*) Examining monthly bank statements
          (*e*) Reading textbook and other materials

(3) Manual activities
- (*a*) Graphing tables from readings of the thermometer
- (*b*) Making graphs and diagrams
- (*c*) Making diagrams from tables to indicate mountains and valleys
- (*d*) Using diagrams in working problems relating to directions
- (*e*) Representing positive and negative numbers on a number scale
- (*f*) Using number scale
- (*g*) Drawing angles
- (*h*) Measuring angles
- (*i*) Rotating angles
- (*j*) Measuring line segments

(4) Applying rules to problems in life activities
- (*a*) Working problems involving temperature readings
- (*b*) Working problems relating to directions
- (c) Locating objects and places in geography, astronomy, and navigation by directed angles.

etc.

The items to and including IA1 were obtained from the N. C. A. report. The specific activities were obtained by observing the pupils at work on the unit. A full statement of aims would show the specific activities related to each of the other twenty outcomes in the same way that the foregoing specific activities are related to the major outcome "understanding the meaning and uses of signed numbers." Thus the

specific activities performed by the pupils in the classroom may be followed through increasingly general objectives until the social objectives are reached; namely vocational preparation, ability to use leisure profitably, ability to meet social obligations, and ability to maintain health. Each of the four social objectives may also be traced back to the specific classroom activities involved in learning the given unit.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

1. Lists of objectives and outcomes proposed by authorities, teachers, curriculum committees.

2. Lists of learning activities performed by pupils, traits manifested by them, pupil problems or difficulties.

3. Facts relating to pupils' school prospects, life ambitions, school progress, abilities, interests, social and occupational status of the family, etc.

4. Lists of pupils' out-of-school activities and traits which are related to the course.

5. Lists of activities, traits, problems of the community which are related to the course.

6. List of those specific objectives (life activities and traits) of value to each pupil or type of pupil.

7. List of most important objectives, activities,

[1] The thirteen types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

traits, problems, interests, topics of course, or materials used in the course.

8. List of course topics related to objectives, activities, traits or problems.

9. List of pupil and teacher activities needed to at-

SOURCES	TECHNIQUES														
	Analysis	Reading and Recording	Observation	Personal Interview	Group Conferences	Diary	Question blank	Check list	Experiment	Testing	Group rating	Individual Judgment	Comparison	Space count	Sampling
Pupils			**2, 3**	**2, 3**		4		2, 3	**11**	**3, 6**	**6, 7**				**13**
Members of class			**4,** 11	**4**				4		**11**	11				
Members of previous classes				4		4	4	4, 5			6, 7				13
Teachers				**1**	1		1	1, 2			6, 7 **11**				**13**
Supervisors				**1**			1	1, 2				6, 7 **11**			
Other authorities on teaching							1	1, 2			6, 7 11				
Subject-matter experts							1, 9				6, 7 11				
Parents				3, 4 5, 10			3, 4 5, 10	3, 4 5			6, 7				13
Occupational groups				5, 10			5, 10	5			6, 7				13
Community members in general				**5,** 10			5, 10	5			6, 7				**13**
Professional literature															
On the curriculum	**1**														
On special methods	**1**														
Texts and courses of study	**1,** 8														
Research studies, surveys, social studies	5														
Popular literature, books, magazines, news, etc	5													7	
School records		**3**											**7**		
Written work of pupils	2													7	13
Local environment			**3, 4 5**												

Boldface figures indicate essential steps; others are optional.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES							
	Analysis	Comparison	Summarizing	Classification	Organizing	Individual Judgment	Frequency Count	Sampling
Objectives and desired outcomes	9	**7, 8**	....	**12**	8, 9, **12**	**6, 7**	....	....
Pupils school activities and traits	10	**7**	....	**8, 9**	8, 9, 12	**6, 7**	....	**13**
Pupils out-of-school activities and traits	....	**7**	....	**8**	8, 9, 12	**6, 7**	....	**13**
Community activities and traits	....	**7**	....	**8**	8, 9, 12	**6, 7**	....	**13**
Community problems and difficulties	....	**7**	....	**8**	.....	**6, 7**	7	...
Pupil errors, problems, difficulties	....	**7**	....	**8**	.....	**6, 7**	7	**13**
Causes of difficulties	....	**7**	12	**9**	.....	6, 7	....	..
Reasons for performing activities	....	**7**	11	8, 9	.....	6, 7	....	....
Methods of performing activities, of meeting difficulties and problems	....	**7**	....	9	8, 9, 12	6, 7	....	....
List of topics for course	....	**7, 8**	....	**8**	**8, 12**	**6, 7**	....	....
Teacher activities and traits	10	**7**	....	**8, 9**	8, 9, 12	**6, 7**	....	**13**

Boldface figures indicate essential steps: others are optional.

tain objectives, i. e., methods of performing life activities, methods of meeting problems and difficulties.

10. Reasons for performing each pupil activity, teacher activity, or life activity.

11. Suggestions for improving list of objectives and topics of the course.

12. A single list or organized outline.

13. Valid and reliable results.

Specimen Service Studies. — The following outlines are based upon actual service studies. They are presented in outline form to represent a variety of service problems involving the definition of objectives. While the problems are chosen from both elementary and secondary grades, the arrangement is by subject. Helpful suggestions toward defining the objectives of

any given course are more readily found from other studies in the same field of subject matter than from studies pertaining to the same grades without regard to the subject matter. The same is true in general of the other four type problems relating to the curriculum. Yet it is also true that procedures illustrated in terms of some one subject may often be adapted to other subjects in which the same problems occur.

Reading — Elementary Grades

Problem No. 1: To define the specific objectives in teaching reading in the intermediate grades of a given school.

Major Assumptions: 1. That the standards governing reading proposed by W. S. Gray in the *Proceedings of the N. E. A.* 1919, (page 580) and proposed by the National Committee on Reading in the *24th Yearbook* of the National Society for the Study of Education include all of the important standards to be collected from the literature.

2. That the reading standards suggested by local teachers are significant.

3. That the reading activities mentioned by a local group of teachers include all of the essential activities.

Procedure: 1. List the reading activities of school and community reported by the teachers in the school.

2. List the reading standards proposed by Gray and

by the National Committee on Reading. (*See* Assumptions.)

3. Submit the list of standards to each of the teachers in the school, asking them to add any others which they think are desirable.

4. Ask each of the teachers to evaluate the reading activities with reference to (a) universality[1] (b) frequency (c) difficulty (d) importance (e) whether taught elsewhere. This evaluation can be made by marking the activities 1, 2, or 3 for each criterion — 3 most, 2 next, and 1 least.

5. Obtain a composite score for each activity by adding the ratings with reference to each criterion.

6. Select as many of the activities most highly evaluated as there is time to teach.

7. Ask each teacher to consider each of the activities in the selected list in connection with each of the standards collected; then to indicate whether the standard applies to the activity and, if so, to indicate its importance by a 3, 2, or 1 rating.

8. Combine the teachers' evaluations of the standards by adding the ratings for each standard, except those marked as not applicable to the activity.

9. List each activity and, in connection with it, the standards which are important in performing it. These are the specific objectives to be attained in reading.

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[1] Universality is determined by the proportion of teachers employing the activity whereas frequency is determined by the number of times each teacher employs it.

Comment on Findings: Such objectives as the following were obtained:

1. To read personal letters, governed by standards of selecting central ideas, noting questions, appreciating mood of writer, speed, etc.

2. To read history textbooks, governed by the standards of organizing material read, evaluating material read, selecting central ideas, speed, etc.

The complete list included 93 activities and 38 standards.

Composition — Elementary Grades

Problem No. 2: To analyze the 6th and 7th grade spelling objective stated as "the ability to spell words used in history and geography."

Major Assumptions: 1. That all the words pupils need to learn to spell in these subjects are the words they use in their written papers in geography and history.

2. That a sampling of the papers will not result in the omission of any important words.

Procedure: 1. Keep a separate spelling list for each pupil.

2. Twice a week check words misspelled on the pupil's written papers in geography and history.

3. Record on the spelling list for each pupil the words he has misspelled. These constitute the words which he must learn to spell to attain the objective.

Grammar — Elementary Grades

Problem No. 3: To determine objectives for third grade grammar in terms of the specific language habits to be developed.

Major Assumptions: 1. That a major objective of third grade English is to develop proper language habits.

2. That the improper language habits of children are those which demand most attention.

3. That the teacher can recognize the improper language habits which are common to her pupils.

Procedure: 1. Once a week, check all of the written work of the pupils in the grade, recording each language error on a separate card.

2. Record each language error made by the pupils in oral speech which is heard in the classroom and on the playground. Get pupils to help note errors and call the teacher's attention to them.

3. Classify the errors into grammatical types.

4. Evaluate the types of errors on the basis of the number of each type collected. Select the most frequent types of errors as the specific habits to be corrected.

Comment on Findings: The speech errors were more varied and more difficult to record. The written errors were comparatively uniform. The errors selected for systematic drill were those occurring most frequently in both speech and writing.

References: *Sixteenth Yearbook of the National*

Society for the Study of Education Part I; W. W. Charters, *Curriculum Construction*, pp. 195-211.

French — Secondary Grades

Problem No. 4: To select from the objectives proposed by authorities for tenth-grade French those which are attainable under the conditions of a given school and to estimate their relative importance.

Major Assumptions: 1. That not all the major objectives upon which authorities agree are attainable in all schools in the time available for instruction in foreign language.

2. That teachers of the subject are able to distinguish the objectives attained by certain pupils from the objectives not attained.

3. That teachers of the subject are able to determine the relative importance of the objectives in terms of pupils' future needs.

Procedure: 1. Compile a list of objectives from books, monographs, committee reports, and articles by authorities on the teaching of French.

2. Submit the list to other teachers of tenth-grade French, asking each to check the objectives which were certainly attained by a clear majority of the pupils in typical tenth-grade classes. Ask the teachers also to specify the conditions that prevent the attainment of the other objectives. Finally ask the teachers to rate the total list of objectives for importance to the members of a typical tenth grade class by marking the

essential objectives 3, the non-essential 1, and the other objectives 2. Add the scores for each objective and rank the objectives in order of decreasing importance as indicated by the combined scores.

3. Accept the attainable objectives which stand above the median in the list when ranked for importance, as valid objectives for the course.

4. Examine the conditions mentioned as obstacles to the attainment of certain objectives and distinguish the conditions that are inevitable from the conditions that the teacher may control or remove by available remedies.

5. Add to the list of valid objectives, any other objectives that stand above the median for importance and that may be attained when the limiting conditions are removed.

Comment on Findings: Valid objectives were found to include "teaching pupils to find the precise word to convey the meaning in translation," "teaching pupils to associate French words with English derivatives," "helping pupils to recognize dominant characteristics of the French people," et al.

Objectives excluded as not valid were "teaching pupils to speak French fluently," "mastery of all irregular verb forms," etc.

Civics — Secondary Grades

Problem No. 5: To define specific objectives or desired outcomes for the unit "Protection of and by the community" in a semester course in civics, ninth grade.

Major Assumptions: 1. That the dominant objective of the course is to teach the need for social cooperation implied by the concept good citizenship.

2. That good citizenship implies an intelligent understanding of the need for protection of life and property and an acquaintance with the community agencies that afford protection.

3. That the frequency with which appropriate objectives are mentioned in recent textbooks on community problems is a valid indication of their relative importance.

Procedure: 1. State the major objective of the unit in sufficient detail to make it entirely clear to teacher and pupil alike.

2. Analyze this statement into its implied meanings and list the meanings as the constituent elements of the unit. Help in making this analysis may sometimes be obtained from the literature and from other expert teachers.

3. Systematically examine chapters in current civics textbooks dealing with community protection and list the objectives found or suggested. Add to the tentative list the new objectives discovered from the texts.

4. Ask pupils to compile individual lists of all the dangers to which members of their communities are exposed.

5. Upon the basis of the data, draw up a revised statement of the subordinate objectives contributing to the major objective of the unit as a whole.

Comment on Findings: The specific objectives for the unit were found to consist in adequate understandings of the following facts and their important implications:

1. There has always been a need for protection and security.
2. The community suffers a tremendous loss from fire, accidents, natural disasters, and crime.
3. Protection from natural disasters is primarily a community problem.
4. The community should assume responsibility for protecting individuals against such menaces as fire, crime, accidents, dishonesty, fraud, and injustice.
5. The community has devised many means by which life and property are safeguarded.
6. Most fires and accidents are preventable.
7. The individual should assume responsibility for reducing the loss from preventable disasters.

Arithmetic — Elementary Grades

Problem No. 6: To define the objective "the ability to use arithmetic in daily life" in terms of pupils' classroom activities.

Major Assumptions: 1. That the arithmetic activities carried on within the community adequately represent the activities which the pupils should be able to perform.

2. That the objective is valid as stated.

Procedure: 1. Have each of the pupils collect arithmetic problems at home and elsewhere, bringing these in twice each week. Classify these problems by type.

2. By means of observation collect the activities carried on by the merchants, mill employees, and farmers which involve the use of arithmetic. List these on slips. Classify problems by type.

3. Interview storekeepers, mill workers, housewives, and farmers asking each for examples of arithmetic problems each has to solve. Classify problems by type.

4. Evaluate the list of type problems by determining the frequency with which they are noted and by asking a few of the better storekeepers, mill workers, housewives, and farmers how important each type problem is.

Comment on Findings: Simple multiplication problems of the following type are most common:

> How much will I receive for 7½ bales of cotton at $10.05?
> What should I pay for 6 bushels of potatoes at 75½ cents?

References: G. M. Wilson "A Survey of the Social and Business Uses of Arithmetic" *Teachers College Contributions to Education* (Columbia University, Bureau of Publications, 1919).

Hygiene — Elementary Grades

Problem No. 7: To define objectives for a third grade hygiene class in terms of specific health habits to be developed.

Major Assumptions: 1. That the development of good health habits is a major objective of school hygiene.

2. That habits essential to good health are those which if not developed result in sickness and disease.

Procedure: 1. Collect from the county health office the records of sickness among school children for the past five years.

2. Determine what kinds of illness are most prevalent.

3. Interview the county physician, asking him to name the habits which reduce or eliminate the most prevalent types of illness.

4. Add to the replies of the physician any habits implied by the discussions of causes of diseases given in books on hygiene, viz. Ritchie, Williams, Holt, et al.

5. Evaluate the habits on two bases:

a. The number of diseases which the habit would prevent or reduce in amount.

b. The importance of the disease as measured by the death-rate from it.

Comment on Findings: 1. The habit of cleaning the hands and face. (Aids in preventing nearly all diseases.)

2. The habit of coughing into a handkerchief. (Aids in preventing respiratory diseases.)

3. The habit of eating foods containing Vitamins B and C (Prevents pellagra, a disease causing the high death rate in the district.)

Home Economics — Secondary Grades

Problem No. 8: To define objectives appropriate to a course in home management with reference to the home condition of girls in rural communities served by the given school.

Major Assumptions: 1. That objectives proposed by authorities for home economics courses in general require modification and different emphasis to meet the needs of rural communities.

2. That the domestic duties performed by the pupils provide a basis upon which to determine the specific needs of the class and hence suggest the appropriate objectives of the course.

3. That the equipment and labor saving devices in the pupils' homes condition the type of instruction provided and consequently affect the objectives.

Procedures: 1. Compile a master list of objectives or desired outcomes from the lists prepared by the American Association for Home Economics Education, the U. S. Bureau of Education, and the Federal Board for Vocational Education. Check the items on the master list that apply to the home management units of the state course of study in home economics.

2. Obtain a list of the major duties performed in the homes of the community by asking the girls to keep diaries of such duties as they perform and notes of other domestic duties performed by their mothers or other members of the household. Interview representative mothers to complete the list.

3. Obtain a list of the cooking and cleaning utensils in each of the homes by asking each pupil to submit an inventory.

4. Adapt the units of the state course of study to the needs of the class by giving special emphasis to the duties actually performed in the homes represented and to the methods of performing the duties which require no utensils except such as are found in the majority of homes or such as can be cheaply purchased.

5. Check the revised units against the master list of objectives and stress the objectives which are best attained by instruction in the performance of the duties recorded. Subordinate the other objectives.

Comment on Findings: 1. Such objectives as "to develop taste in the preparation of fancy dishes" were eliminated by the evidence that no fancy dishes were prepared.

2. Such methods were taught as "beating an egg with a fork" since few of the homes contained Dover egg beaters.

3. Such objectives were stressed as "developing good judgment in budgeting expenses for food," "familiarizing pupils with efficient methods of house cleaning without labor saving devices," et al.

Evaluating School Objectives — Elementary Grades

Problem No. 9: To evaluate the school's objectives and results with reference to the needs of pupils in the

intermediate grades (4 to 6) and with reference to desirable changes in the program of studies.

Major Assumptions: 1. That acceptable objectives for the work in grades 4 to 6 have been formulated and that teachers are striving to attain the objectives so far as conditions permit.

2. That the parents of the pupils enrolled in these grades are for the most part capable and willing to indicate defects in the children's training that the school should seek to remedy.

3. That the teachers of these grades are capable and willing to analyze their working objectives with reference to the stated objectives of the school and with reference to the defects in the pupils' training.

Procedure: 1. Appoint a committee of three teachers, one from each of the grades concerned, to prepare a list of major objectives applicable to the intermediate grades as contained in professional literature of recent date. Check the resulting list of objectives against the statement of objectives accepted by the particular school and modify the latter where desirable. Submit both the objectives obtained from the literature and the revised statement of the school's objectives to each teacher of the three grades for criticism and suggestions regarding further revision of the school's objectives. Incorporate the criticisms and suggestions upon which the teachers are somewhat closely agreed.

2. Present the problem as clearly as possible to the intelligent members of the school community through the parent-teacher organization, the community service clubs, and other organized groups available. Ask for volunteers from such groups to assist the school in defining and meeting the pupils' educational needs that may not be receiving sufficient attention.

3. Supply each volunteer with the list of school objectives as approved by the intermediate teachers and ask him to indicate the relative importance of each objective on a three or five point scale. Ask each volunteer also to indicate defects in the training of intermediate grade pupils as observed either in their own families or in the community at large. Explain how the list of objectives may be used to suggest such defects, when each objective is considered in turn. Interview any outstanding critics of the school as, for example, the editor of the local paper.

4. Examine reports of surveys made of schools comparable to the schools concerned and list any defects mentioned that are likely to apply to the school.

5. Ask the teachers of the grades concerned and of other grades as well to note the more serious discrepancies between the stated objectives and the results obtained in these grades.

6. Summarize the defects obtained from all sources and classify them according to the objectives. Submit the classified list to teachers, asking each teacher to

make recommendations concerning revisions of the program that might tend to remedy the defects. Note the frequency with which defects of the same type are mentioned and concentrate first on the most frequent types.

7. Consult professional literature, especially the recommendations of school surveys, and note the respects in which the existing program for the intermediate grades should be modified in respect to subject matter, teaching procedures, and general organization. Formulate a plan for the experimental selection of the new content and teaching procedures recommended by the teachers from the various suggestions received.

Comment on Findings: 1. Many groups of persons who had been aiming hostile criticism at the school were persuaded to aid in a constructive program of improvement when they understood that the school officials earnestly desired to remedy any significant defects in the existing program.

2. The most significant defects discovered were three: (a) lack of wholesome recreational training; (b) lack of an adequate health program; (c) lack in development of the following traits deemed necessary for children in the home and community (1) cleanliness, (2) courtesy, (3) helpfulness, (4) industry, (5) kindliness, (6) loyalty, (7) patience, (8) self-control, (9) thrift.

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3. Constructing or Reorganizing the Course

(Type Problem I B)

To construct a course of study for all pupils of a given grade is virtually to make a curriculum; if the new course is to articulate with other courses and contribute directly to the objectives set up for the given grade, department, or school. The construction of a curriculum, however, is a problem clearly beyond the abilities of the individual teacher or supervisor. To construct a curriculum even within the limits of a single course should be regarded as a research enterprise, whenever the study is not confined to a particular class or at most to a particular school. The time, money, and technical training required properly to develop a sequence of courses to be taught by several teachers, are not possessed by the great majority of administrators, supervisors, and teachers in service.[1]

Problems. — The service problems in reorganizing a course are thus restricted to problems in the selection of content for a single course or part of a course, for which a single teacher or supervisor is mainly responsible. The discussion of objectives in the preceding section should simplify the present discussion. The problem involves the selection of major units or divisions of the course which correspond to the objectives

[1] For an explicit description of techniques to be applied by a staff of teachers under the direction of a specialist in curriculum construction, see Henry Harap, *The Technique of Curriculum Making* (Macmillan, 1928).

defined — as when the objectives of a course in science represent a series of principles to which separate units may be devoted. Objectives defined in terms of processes or skills, as in English composition, do not in themselves suggest units. Hence, units of such courses must be derived by classification of items of subject matter upon some other basis, such as ease of learning, logical sequence, relation to the same type of life situation, or others.

The definiteness with which the objectives have been defined thus determines to how much detail the subject matter may be specified. Hence the type-problem of defining objectives somewhat overlaps the type-problem of constructing or reorganizing the course. When a specific course is chosen for study it presents either a problem of objectives or a problem of content or both problems combined.

Assumptions. — The nature of the problem of designating the constituent elements of a course prevents the statement of certain assumptions as more significant than others. Research has yet to define techniques whereby content may be systematically derived from objectives. Hence one must assume that objectives are set up, decide upon the most pertinent units, then test them by experiment.

The fundamental assumption, therefore, is that the decisions made in selecting objectives and in defining appropriate units of subject matter are wise.

Data. — In defining units or unit titles, it is a

matter of some importance to select the type of unit to be defined. Three types of unit organization are commonly employed. The nature of the subject matter, the stated objectives, and the maturity of the pupils should determine which type of organization is best. Pupils in the elementary and junior high schools more readily appreciate the significance of units which are organized on a *functional* basis. In senior high-school courses for pupils who will continue the subject in college, there is much to be said in favor of the *structural* organization. When time permits and when the structure of the subjects should be emphasized, it is sometimes possible to present the units on the *structural* basis and then review them from the *functional* point of view, or vice versa, thus realizing the advantages peculiar to both types of organization. The three types of major units may be suggested by the following examples from a junior high-school course in hygiene.

UNITS FOR AN EIGHTH-GRADE COURSE IN HYGIENE

ACCORDING TO STRUCTURE	ACCORDING TO FUNCTION	ACCORDING TO STRUCTURE AND FUNCTION
Alimentary System	Digesting foods	Digesting foods
Circulatory System	Replacing waste tissue	Exercising
Nervous System	Moving the body	Breathing
Respiratory System	Breathing	The Skeleton
etc.	etc.	Nervous System

Type Procedure. — The following procedure is presented to indicate the major steps in defining units

and selecting content as found in the specimen outlines of pp. 136 ff. The steps need to be adapted to the sort of conditions mentioned in the foregoing paragraphs before they can be applied to the investigation of a specific problem.

The Problem. To define suitable units of subject matter that lead to desired outcomes of a given course and to select appropriate content for each unit.

Abstract of Procedure. 1. State the major objectives and desired outcomes of the course as previously defined. (See Specimen Studies, No. 1, Step 1; No. 2, Steps 1, 2.)

2. Assemble school textbooks, syllabi, outlines, and published courses of study for the given grade and subject. After consulting the material, decide whether the units are best organized on the basis of structure, function, life activities, problems, principles, or other bases. Select one such basis of organization. (See Specimen Studies, No. 3, Step 1; No. 4, Step 1; No. 5, Step 1; No. 7, Step 1.)

3. From the chapter titles and paragraph headings found in the text materials and from any other appropriate sources, make a list of the items which represent the basis of organization decided upon and which might serve either as unit titles or as topics to be included within the units. Then arrive at a tentative list of units by classifying the items under headings suggested by the items themselves. (See Specimen Studies, No. 2, Steps 2, 3, 4; No. 4, Step 2; No. 5,

Step 2; No. 6, Step 1; No. 7, Step 2; No. 8, Steps 4, 5; No. 9, Steps 1, 2.)

3a. (Optional.) Submit the unclassified list of topics for criticism to other competent teachers and supervisors of the given subject and grade. Ask each critic to formulate titles for approximately five units (in a semester course) and to indicate which of the topics contained in the master list are considered most appropriate to each of the titles proposed. The units should be selected on the basis of importance in attaining the outcomes and should overlap no more than is necessary to make each unit substantial and coherent. (See Specimen Studies, No. 1, Step 3; No. 4, Step 3; No. 5, Steps 3, 4; No. 7, Steps 3, 4.)

3b. (Optional.) Study the returns from each critic and revise the tentative selection of units to the end that each unit may contain material leading directly to the desired outcomes and so organized that its meaning and coherence are apparent to the pupils. (See Specimen Studies, No. 4, Step 4; No. 5, Step 5; No. 7, Step 5; No. 9, Step 3.)

4. If a single textbook, syllabus, or published course of study is found to contain approximate material for all or nearly all of the units chosen, adopt it for the given course and modify it by supplementary materials as needed. If several texts are needed to supply the basic material for the different units, base the course on the unit outline and prepare references to the texts applicable to each unit. (See Specimen Studies, No. 1,

Steps 2, 4; No. 3, Steps 2, 3; No. 4, Steps 5, 6, 7, 8; No. 6, Step 2; No. 8, Step 7.)

5. Try out the material as thus tentatively organized. Note pupils' difficulties that are due to the nature or organization of the unit and the unit content. Revise the organization of the material to remove such difficulties. Test the adequacy of the units by tests based upon the desired outcomes. (See Specimen Studies, No. 4, Step 9; No. 5, Steps 6, 7; No. 7, Step 6; No. 9, Step 4.)

Type Study. — The following type study is concerned only with the definition of units. It thus does not apply to steps 4 and 5 of the Type Procedure. These steps concern the selection of content for the units and the location of the pupils' difficulties that require changes in the organization or content of the units. For illustration of steps 4 and 5 the reader is accordingly referred to the specimen studies and to the general techniques of Chapter VI.

Problem. To define units of subject matter suitable for an eighth grade course in home economics.

Assumptions. 1. That objectives have been defined for the course in terms of the abilities needed to solve the problems of household management in urban communities.

2. That "household management" has been analyzed into the significant activities it involves and that this list of activities is sufficiently complete to cover the desirable content of the course.

Procedure. (See the foregoing "Type Procedure" for complete list of steps.)

Step 1

"State major objectives and desired outcomes."

For an illustration of the statement of objectives see the type study for Problem I A, pages 93 ff. Illustration of this step is omitted here on the basis of Assumption 1.

Step 2

"Assemble text materials available and decide upon what basis the units are best organized."

This step can not be conveniently illustrated in small space and probably does not require illustration. The step is sufficiently covered by Assumption 2, which states that the units are to be organized on the basis of the significant *activities* of household management and that a sufficiently complete list of such activities has been prepared.

Steps 3 and 3a

"List items representing the chosen basis of unit organization and classify the items to determine units. Submit unclassified items to competent jury for classification under unit titles to be formulated."

The check list[1] to be shown for illustration contains

[1] Adapted from Henry Harap, *The Technique of Curriculum Making*, pp. 120 ff.

a list of significant activities classified under headings suggested by the items themselves. The columns to the right are provided for the criticism and rating of each item according to the direction given. The purpose of the check list is to secure judgments from competent critics that may help both in selecting the more important activities from the less important and in improving the organization of units as represented by the headings under which the activities are classified.

Directions to Accompany the Check-List

1. In the first column answer *yes* or *no* to the question: Can pupils learn outside of school to perform this activity properly?

2. In the second column indicate the relative importance of the activity for eighth-grade girls on a scale from 3 to 1—1 meaning not important, 3 meaning very important, and 2 meaning average importance.

3. In the third column indicate similarly the relative interest of this activity to the pupils, on a scale from 3 to 1.

4. In the fourth column answer *yes* or *no* to the question: Is the activity too difficult for eighth-grade pupils to learn to perform?

5. In the fifth column check the activities considered appropriate for the eighth-grade course in home economics.

6. In the sixth column write the number of the unit heading under which the activity might be more appropriately placed. Change the headings that need to be changed and add new headings where necessary, giving new numbers to the headings added.

		I	II	III	IV	V	VI
1. Selecting foods							
To know the function of protein in the diet	1						
To guard against the over-consumption of meat	2						
To consume a sufficient quantity of fruit	3						
To know the foods rich in protein	4						
2. Eating cereals							
To know the function of cereals in the diet	5						
To recognize the forms in which cereals occur	6						
To decrease the cost of the food bill by increasing the amount of cereal in the diet	7						
To increase the consumption of oatmeal	8						
3. Measuring and calculating food and fuel							
To read a graduate glass	9						
To read the gas and electric meter	10						
To ascertain the amount saved by a large quantity purchase	11						
To use the ton, cord, and kilowatt hour in fuel calculations	12						
To calculate the dividends of a member of a co-operative store	13						
4. Owning a home							
To know the relative cost of the chief types of dwellings	14						
To become acquainted with the opportunities of building and loan associations	15						
To know the details of taxation connected with home ownership	16						
To ascertain the relative advantages of owned and rented homes	17						
5. Ventilating a house							
To know the approved standards of ventilation	18						
To know the relation between dust and open windows	19						
To know that cool surroundings stimulate work	20						
To cultivate the habit of using a thermometer	21						
To use devices to keep the air in circulation	22						

		I	II	III	IV	V	VI
6 Buying Furniture							
To distinguish birch from mahogany	23						
To identify a veneer	24						
To know the relative durability of the chief furniture woods	25						
To know the common woods which enter into the furniture of the nation	26						
To identify the print of quartered oak on cheaper woods	27						
7. Repairing household appliances							
To repair a door knob	28						
To repair broken china and glass	29						
To keep a reproducer and motor in good order	30						
To mend rubber articles	31						
8. Heating							
To know the most comfortable room temperature	32						
To know how to humidify the air	33						
To know the relative advantages of the several heating systems	34						
To own and use a thermometer	35						
9. Selecting clothing							
To understand the nature of fashions in clothing	36						
To know how fashions affect the wearing quality of clothing	37						
To know the effect of staple fabrics and novelty fabrics on price	38						
To know the effect of ill-fitting or tawdry clothing on one's social relations	39						
10. Washing linen clothing							
To know the laundering properties of linen	40						
To know the effect of dyes on linen	41						
To recognize linen that is finished with starch, glue, or gum	42						
To know the hygienic properties of linen	43						

Step 4

For an illustration of the selection of content from textbooks and other source materials see the type study for Problem I C, pp. 165 ff.

Step 5

For an illustration of the location of pupils' difficulties resulting from the content and organization of the units, see the type study for Problem I D, pp. 194 ff.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

1. List of objectives and outcomes for the course proposed by authorities, teachers, curriculum committees (See Type Problem I A).
2. List of objectives specifically defined with reference to the course.
3. Desirable method of unit organization for the course.
4. List of course units and their definition in terms intelligible to the pupils.
5. Lists of topics, materials, exercises, and class activities found in similar courses.
6. List of materials, traits, and activities of home and community relating to the course.

[1] The fifteen types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

SOURCES	TECHNIQUES													
	Analysis	Reading and Recording	Observation	Personal Interview	Group Conferenc.	Diary	Question-Blank	Check-list	Class Assignment	Experiment	Testing	Group Rating	Individual Evaluation	Sampling
Pupils			**5**, 6	4, **7**		6		6	**4**, 7	**14**	**7**, **13**			**15**
Members of class			**7**, **13**	**13**										
Members of previous classes				6		6	6	6						15
Teachers				**1**,**3**,**4**,5,	1, **2**		1,2,3,4,	6,7,				**10**, **11**		**15**
				7, **14**	6		**5**, 7	**8**						
Supervisors				**1**,**2**,**3**,**4**,				6,7,					**10**	
				5, 7, **14**				**8**					**11**	
Other authorities on teaching							**1**, **2**, **3**, 5, 7, 14	8				**10**, **11**		
Subject-matter experts							1, 2, 3, 5, 14	8				10, 11		
Parents				6, 7			6, 7	6, 7				10		15
Occupational groups				6			6	6				10		15
Community members in general				**6**			**6**	**6**				**10**		**15**
Professional Literature on the curriculum	**1**, 3													
on special methods	**1**, **3**, 7, 12													
on educational psychology	7, 12													
bibliographies														
school-supply catalogues		**8**												
tests and courses of study	**1**,**3**,**5**,7	**4**												
research studies in learning	7, 12,													
Popular Literature	**6**													
Written work of pupils	**7**													15
Local environment			**6**											

Boldface figures indicate essential steps; others are optional.

7. List of pupil difficulties, errors, problems relating to the course.

8. List of topics, materials, activities, problems, and exercises appropriate to the unit organization selected.

9. List of topics, materials, activities, problems, and exercises classified with reference to each unit.

10. Elimination of topics, materials, activities, problems, and exercises not needed to attain objectives and inclusion of additional ones needed to attain objectives.

11. Most important objectives, topics, difficulties, activities or materials.

12. Organization of topics, materials, teacher- and pupil-activities so as to facilitate learning.

13. List of pupil difficulties with each unit.

14. Suggestions for improving unit plan, organization or development.

15. Valid and reliable results.

Specimen Service Studies. — The more closely a given course is related to the life activities either of pupils or adults, the more readily can objectives, units, and content be defined. The following outlines therefore include a number of studies from the field of practical arts which illustrate techniques that in many cases apply also to academic subjects.

Reading — Elementary Grades

Problem No. 1: To determine the content of a course in work-type reading for the intermediate grades.

Major Assumptions: 1. That content for the course should consist in pupil activities that best develop the reading skills defined by the objectives.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES							
	Analysis	Comparison	Summarizing	Classification	Organizing	Individual Evaluation	Frequency Count	Sampling
Objectives and outcomes for the course...	**2**	**8, 14**	....	**9**	**12**	**11**	....	....
Pupils' school activities, traits, problems, difficulties	....	**8**	7	**9**	**12**	**11**	11	**15**
Pupils' out-of-school activities, traits, problems, difficulties	....	**8**	7	**9**	**12**	**11**	11	**15**
Community activities, traits, problems, difficulties	....	**8**	6	**9**	**12**	**11**	11	**15**
List of materials related to the course....	....	**8**	....	**9**	**12**	**11**	....	....
List of topics for the course	**8**	**8**	....	**3, 9**	**3, 12**	**11**	....	....
Methods of performing activities and meeting problems and difficulties	....	**8**	....	**9**	**12**	**11**	....	....
List of pupil and teacher activities for each unit	....	**14**	....	....	....	**11, 14**	....	....

Boldface figures indicate essential steps; others are optional.

2. That teachers of intermediate grades are competent to collect and evaluate such pupil activities.

Procedure: 1. At a teachers' meeting, distribute copies of the outcomes desired from reading, defined in terms of abilities. Discuss each outcome until each teacher has a clear understanding of its implications.

2. Request each teacher to prepare a statement of the reading materials and pupils' activities that have proved most efficient in developing each ability. References to books and articles on the teaching of reading may be supplied as a source of additional suggestions.

3. Collect the suggestions submitted for each ability and prepare a master list of materials and activities. Then ask each teacher to rate each item listed with reference to the appropriate ability.

4. Select the basic materials and activities for the course on the basis of the highest combined ratings.

Comment on Findings: 1. The teachers were substantially agreed as to the basic activities. Useful variations proposed by individual teachers were welcomed by others.

2. Less agreement was found in regard to appropriate reading materials, yet the materials receiving the highest ratings were considered superior to materials previously used by certain teachers.

English Composition — Secondary Grades

Problem No. 2. How to define units for a course in usage in remedial composition work.

Major Assumptions: 1. That the course is composed of pupils noticeably deficient in written English.

2. That objectives for the course are stated in the form of errors to be eliminated from the pupils' written English.

3. That units are best defined in terms of principles that are common to several errors habitually made by the pupils concerned.

Procedure: 1. Devote the first two weeks or less to informal discussion of typical errors and difficulties in written English. Specimens of the pupils' written work in other courses should be criticized and compared with superior specimens of other pupils' work. On the basis of such discussion, have each pupil write

a series of papers. The writing should be effectively motivated and done in the class period.

2. Read the papers carefully for errors. Check the errors on a mimeographed master error sheet (such may be found in the literature). There should be a separate sheet for each pupil's set of papers. From these mimeographed sheets make a tabulation of the frequency of errors in all papers.

3. The frequency of errors as shown by this tabulation will suggest the point of departure in selecting units. For example, if the frequency column shows fragment sentences and run-on sentences to be the most frequent, "Sentence Recognition" will constitute the first unit of work in the course.

4. Similarly, an attack upon each of the main categories of errors will be made by giving an appropriate unit of usage which governs the mistakes made.

5. Compositions written from time to time may be checked for errors to determine the subsequent units.

6. The individual mimeographed sheets for each pupil will suggest sub-units of instruction for each pupil. The major units will be taught only when the class as a whole needs instruction.

Comment on Findings: Examples are suggested in the foregoing procedure. For further examples, see H. A. Anderson, *A Study of Errors in Composition in the University of Chicago High School* (Master's Thesis, Chicago, 1926). This study reviews all previous studies in the field.

American History — Elementary Grades

Problem No. 3: To define units in American history for an introductory course at the third and fourth grade levels.

Major Assumptions: 1. That the objectives for the introductory course have been defined in terms of the historical periods described in the stories most appealing to pupils in these grades.

2. That the desired outcomes for the course emphasize familiarity with the important characters and the more picturesque living conditions of each period.

Procedure: 1. Assemble reading lists prepared for the intermediate grades and classify the historical items according to chronological periods which constitute the units of the course. Select some one personage to represent each period concerning whom at least one brief, vivid, simple, and reasonably accurate account is available. Wherever a choice is offered, personages most typical of the period should be preferred.

2. Compare the units thus tentatively defined with a number of standard introductory history textbooks. Where the periods described in the texts show important omissions in the tentative units, the omissions should be supplied, if sufficiently colorful reading material can be found.

3. Divide the reading materials selected for each unit between those which pupils may read themselves

and those to be read by the teacher. Organize readings of the latter type into projects and dramatizations involving other subjects when possible.

Comment on Findings: 1. One unit comprised the civil war, with Lincoln as the central figure. Mary Andrew's *The Perfect Tribute* was told by the teacher and passages from Wister's *A Boy's Life of Lincoln* were selected for pupils' own reading.

2. The units as a whole differed from the conventional textbook chapters chiefly in that political and military issues were subordinated to the social and vocational developments of each period.

Ancient History — Secondary Grades

Problem No. 4: To select content for a unit entitled "The Ancient Greeks: Enlighteners of the World," such a unit to appear in a tenth grade course — Survey of Civilization.[1]

Major Assumptions: 1. That the course is of sufficient importance to be included in the curriculum and that the unit is justified by the stated objectives of the course.

2. That the unit is to represent the pupils' only point of contact with the history of ancient Greece.

3. That the statement of objectives for the course has been developed to the point at which the desired outcomes for the unit on Greek history have been

[1] By courtesy of Howard E. Wilson, graduate School of Education, Harvard University.

specified in terms of the major facts to be learned about ancient Greek Civilization.

Procedure: 1. Assemble all the high-school texts, outlines, manuals, courses of study, etc., which contribute in any way to the desired outcomes specified.

2. On the basis of all the material collected, make a complete outline of the events or topics of Greek history which have been suggested as valuable in high-school classes elsewhere in obtaining the desired outcomes.

3. Submit a statement of the outcomes and a copy of the outline to a group of competent critics, asking each to eliminate from the outline what he considers unnecessary or least useful to the attainment of the outcomes. The critics should include (a) the investigator himself, who may be presumed to be most interested and willing to devote most time to the criticism, (b) several experienced teachers, (c) school administrative officers who have been students of ancient history, (d) parents, and (e) experts in the teaching of social science.

4. Analyze the returns, securing a generally-agreed-upon outline of subject matter, for use as a point of departure in actual teaching.

5. Select textbooks and supplementary readings on the basis of (a) the adequacy of their treatment of the subject matter outlined and (b) the spirit and attractiveness of the style.

6. Collect the selected references in sufficient number for pupils' use in the classroom.

7. Select the best corollary accounts, published sources, historical novels, biographies, etc., for the chosen subject matter and provide a reserve shelf for the material in the general school library.

8. Prepare a tentative list of pupils' activities in learning the subject matter with reference to the unit outcomes.

9. Experiment with various learning activities under actual teaching conditions, repeating the process as many times as necessary to select the activities most useful in attaining each type of desired outcome.

Comment on Findings: The following "study activities" represent sub-topics of the unit organized for pupils' study. The unit comprised twelve such study assignments in all. The missing numbers indicate the assignments omitted:

1. Read Halleck and Frantz, *Our Nation's Heritage*, pp. 51-89. This is an overview of the entire unit which we are beginning. It gives a bird's-eye view of the unit. Try to get from your reading a general understanding of the topics we are to study individually later. If you do this, you can see the topics in their proper perspective when we come to study them.

5. Sparta and Athens were the leading cities of ancient Greece, but they were not at all alike in many respects. Make a list of the characteristic features of each city which made it important.

   References:

   Barnard and Roosback, *Epochs*, 58-62.

   Botsford, *Brief History of the World*, 37-43.

   Halleck and Frantz, *Our Nation's Heritage*, 56-59.

Seignobos, *Ancient Civilization*, 128-148.
Webster, *Ancient History*, 167-176.

7. Toward the close of the Persian Wars Athens had become the leading city of the Greek world. During the "Age of Pericles" the Athenians reached a very high stage of civilized thought and action. Write a theme of from three to five pages, summarizing "The Achievements of Athens and the Athenians" during the age of Pericles.

References:
Botsford, *Brief History of the World*, 54-70.
Robinson and Breasted, *History of Europe*, 137-148.
Webster, *Ancient History*, 211-233.
Westermann, *Story of the Ancient Nations*, 145-164.

12. How was Greek civilization spread throughout the ancient world? Answer in a theme of not more than a page and a half.

References:
Halleck and Frantz, *Our Nation's Heritage*, 66-70, 103-6.
Robinson and Breasted, *History of Europe*, 169-187.
Seignobos, *Ancient Civilizations*, 173-187.
Webster, *Ancient History*, 247-248, 259-278.

References: M. L. Daun "Teaching World History in the Secondary School," *Historical Outlook*, 18; 322-325; R. Wanger, "World History Taught by the Dalton Plan," *Historical Outlook*, 18; 383-390.

Arithmetic — Secondary Grades

Problem No. 5: To define units and select appropriate content for a course in eighth-grade arithmetic, organized for pupils of less than average ability.

Major Assumptions: 1. That the social needs for arithmetic in the given school community are not sufficiently met by the material contained in any one textbook, and that such needs may be adequately met by materials contained in several textbooks available.

2. That the desired outcomes of the course have been defined in terms of specific uses for arithmetic by pupils not planning to enter high school and also in terms of the principles preparatory to algebra in the ninth grade.

3. That units should be defined with reference to the needs of both types of pupils — i.e., high-school candidates and pupils intending to leave school upon completion of the eighth grade.

Procedure: 1. Collect the materials contained in available textbooks and other courses of study which relate to one or more of the desired outcomes for the course as previously defined.

2. Classify such materials with reference to the major arithmetical process involved and regard the main headings of the classification as tentative units for the course. Revise such headings on the basis of specimen units for junior high-school arithmetic, as found in literature on the teaching of junior high-school mathematics.

3. Submit the list of desired outcomes and the materials classified under the tentative unit titles to several expert teachers of arithmetic. Prepare a cross-check sheet with the desired outcomes of the course at the

left of the rows and with no headings at all for the columns. Ask each teacher to compare the outcomes with the list of materials and then to formulate at least five unit titles considered appropriate for the pupils described. The unit titles should not over-lap more than necessary.

4. Direct each teacher further to write the five titles formulated at the top of the columns on the cross-check sheet, then to note in each column the specific materials considered relevant to the unit title appearing at the top of the column and also relevant to the desired outcomes listed to the left of each row.

5. Compare the returns and combine them by selecting the unit titles found most appropriate and such materials for each title as are related most directly to the title and to the desired outcomes of the course.

6. Submit the unit titles themselves to the class, asking each pupil to state on paper what he understands the unit to mean.

7. Clarify the unit titles where necessary and select exercises and illustrative materials as content for each title found satisfactory.

Comment on Findings: 1. Such titles were chosen as the graph, the formula, rapid computation, et al.

2. The judges showed closer agreement in relating the textbook materials to the units than in relating the materials to the desired outcomes. Hence in general only the materials directly related to the outcomes were finally retained in the units. Exception was made,

however, in the case of materials found necessary to make clear the materials that were retained.

Nature Study — Elementary Grades

Problem No. 6: To define the units of a fifth grade course in nature study when the objectives have already been defined in terms of the questions asked by the children.

Major Assumption: That the classification of questions asked by children is a valid basis for the organization of units in nature study.

Procedure: 1. Classify the questions children ask on the basis of the scientific principles which will explain them. These classes serve as the units in the nature study course.

2. Select the text material which is helpful in providing explanations for each group of questions.

Comment on Findings: 1. "Why do glasses break in hot water sometimes and not at other times?" is a characteristic question.

2. Such questions are answered by elementary science facts that lead readily to reading, simple experiments, and directed observation.

General Science — Secondary Grades

Problem No. 7: To organize a curriculum in science of three consecutive courses in the three junior high-

school grades with reference to the needs of an industrial community.

Major Assumptions: 1. That the objectives and desired outcomes of the curriculum have been defined in terms of science principles that serve to explain the processes involved in local industries or that suggest efficient methods of solving the science problems of the home and classroom.

2. That such principles should be taught with reference to the more important and difficult situations to which the principles apply in the given community.

Procedure: 1. Collect courses of study published by industrial city school systems maintaining junior high schools.

2. Combine units selected from such courses and from junior high-school textbooks in general science to form an approximately sequential list of unit topics designed to cover the three courses.

3. Submit the list of unit topics to teachers of science in the given city, allowing plenty of time for its careful examination. Ask each teacher to list in a parallel column the most important applications which a junior high-school pupil might make of each topic in the given community. By "application" is meant a concrete example of a situation in the pupil's present or future experience to which the information represented by the topic might be directly applied.

4. Submit the list of applications obtained from the

teachers to a local group of men and women prominent in business, civic, and domestic activities. The individuals should be selected with regard to their interest in the problem of improving the junior high-school science course. Ask each individual to mark the applications 1, 2, or 3 to indicate their relative importance in the community.

5. Reject the applications rated unimportant. Organize the remaining applications for teaching purposes in relation to appropriate units. Omit the unit topics for which no important applications can be found and which are not needed to give coherence and clarity to the materials selected.

6. Regard the organized list of applications as a series of life problems to be taught in connection with the textbooks containing the basic material of the course. Try out the problems in the classroom and emphasize those that are found most useful in teaching the important science principles of each unit.

Comment on Findings: 1. The applications found most important included such problems as "how to explain the iron smelting process," "what are the various means of reducing the smoke nuisance in mill cities," "how to prepare meals for children of different ages," et al.

2. The units related to the important applications included such units as "The Chemistry of Iron and Steel," "The Selection and Use of Fuels," "What Foods Best Resist Disease."

Household Mechanics — Secondary Grades

Problem No. 8: To define and construct units for a course in household mechanics for girls, with reference to the needs of the given school community.

Major Assumptions: 1. That the assumed value and evident popularity of junior high-school courses in household mechanics for boys justify the development of a similar course for girls.

2. That the desired outcomes of the course have been defined in terms of experience with the established course for boys.

Procedure: 1. Address letters to about thirty representative homes of the school community to request a list of the mechanical problems of most frequent occurrence.

2. Compare the list of problems thus obtained with the list of problems gathered by L. D. Fuller in his study reported in the *Journal of Educational Research*, March, 1921, "Manual Arts Based on Home Repair." Add to Fuller's list the new problems reported by the local homes.

3. Submit the extended list to all parents of children attending school, anticipating a return of approximately 30%. Ask each home to check and give a specific example of the problems or mechanical jobs that the women of the family have ever met, to underscore the jobs that can be done without special training, and to check twice the jobs for which professional repair men are usually called in.

4. Summarize the returns by selecting as basic material for the course those jobs that are in general the most frequently required and for which expert assistance is usually necessary.

5. Analyze the selected jobs to determine the mechanical processes and principles involved. Group together the jobs involving the same major process or principle. Regard the jobs thus grouped as tentative units for the course.

6. Check the jobs from each class which are learned to better advantage in the pupils' own homes than in the school shop. Reserve such jobs for home projects in connection with the appropriate units.

7. Develop the mechanical principles relating to each of the tentative units by selection from available textbooks and trade manuals. Outline such principles in topical form and follow each topic with appropriate references.

Comment on Findings: 1. The jobs were found to differ considerably from the jobs similarly collected for boys, for example — the repair of mechanical sweepers and washing machines was frequently stressed.

2. The mechanical processes which constituted the basis of the units were, on the contrary, very similar to the processes in the units for boys.

General Shop — Secondary Grades

Problem No. 9: To evaluate and reorganize the unit on "electrical installation and repair" as one of

six units in a general shop course designed to provide vocational and educational guidance for seventh grade boys in a metropolitan junior high school.

Major Assumptions: 1. That to furnish the most helpful guidance to boys who may become electrical apprentices, the processes introduced in the electrical unit should represent the actual work of electricians as closely as possible.

2. That for other boys the unit should emphasize the physics of electricity sufficiently to serve the purpose of educational guidance through the medium of shop work.

3. That only ten hours of class time are available for the unit.

Procedure: 1. Select at least one man to represent each of the electrical trades mentioned in the classified advertising telephone directory for the city. (Twenty-two different electrical trades were found so listed.) Interview each representative to determine the duties that are characteristic of his work.

2. Conduct each interview as follows: "Suppose a twelve year old boy comes to you who wants to know something about the electricians job, with a view to deciding whether or not to take it up as a life occupation. He is able and willing to pay you for your time and trouble in giving him the information. He wants you to show him in a few short periods what the electrician's work consists of. What would you show him if you had only ten hours with him and tried to

select the jobs that you consider typical of your trade in any large city?"

3. Make a master list of the jobs obtained from all interviews and select those jobs which meet each of the following requirements (a) readily explained by demonstration to seventh grade pupils, (b) representative of a particular electrical trade, and (c) involving a significant fact or principle in electricity that is not prominent in the other jobs selected.

4. Assign two or three of the occupational projects so selected to each boy in the class, each boy having a different assignment. Arrange for the class as a whole to listen to an explanation of each project, thus meeting the difficulty of acquainting each boy with twenty odd types of work when time is available for the actual performance of only two or three shop operations in this unit.

Comment on Findings:

Original Course (for all pupils)	New Course (for individual pupils)
1. Splicing, wrapping and tapping wire joints.	1. Splicing, wrapping and tapping wire joints
2. A series of bell-wiring exercises beginning with the simplest type (dry-cells, push-button and bell) and going to those of more complexity return bell circuit annunciators door-openers	2. Bell wiring 3. Annunciator work 4. Burglar Alarm 5. Making toy motor 6. Wiring electric toaster 7. Making transformer for Xmas tree 8. Winding bell-ringing transformer

fire and burglar alarm

3. Simple electric light circuit involving
   splicing, soldering light wire and wiring circuit of one light and one switch
9. Replacing burnt-out heating unit in electric iron or curler
10. Re-wire an electric lamp
11. Fit-up extension cord with plug and socket
12. Simple one-light, one-switch light circuit
13. Make battery of wet cells
14. Connecting door bell with dry battery
15. Install buzzer for dining room
16. Make electro-magnet
17. Testing for burnt-out fuses
    Replacing fuses, purpose of fuses
18. Wiring lighting fixtures
19. Make radio receiving set
20. Make telegraph instrument
21. Connect electric lamp with base board socket (Use metal moulding on baseboard)

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4. Selecting Text Materials

(Type Problem I C)

To determine objectively the relative merits of the textbooks available in a given field and with reference to the objectives of a given course is a research problem of impressive size. To evaluate several textbooks objectively one must first negotiate the problems of defining objectives and outlining appropriate units. When the course has thus been outlined in detail, it becomes possible to evaluate the existing texts by checking each book to discover what topics of the outline are treated and which treatment of each topic is best. The best book would be the one containing the largest number of satisfactory treatments of the largest proportion of the topics.

Such a procedure is seldom followed because it is scarcely less difficult than to write a new textbook, and the new textbook is likely to prove more satisfactory. The problem of selecting text materials reduces itself in practice to a comparison of the texts within a given field to discover their common features, a rating of the different features in terms of the pupils' needs, and a selection of the texts containing the largest number of desirable features. Such a method of selection is highly objectionable from the research point of

view, since the criteria themselves as well as the ratings are often invalid or unreliable. Yet as a service study, the procedure is decidedly more reliable than selection by the uncontrolled judgment of one or more individuals with no other criteria than their personal impressions.

What is essentially this inter-comparison method has been followed with some success in a service study of this problem.[1] The purpose of the study was to evaluate published textbooks and courses of study in the various elementary school subjects. The procedure consisted in collecting all representative courses of study, defining from these courses the qualities or characteristics considered important, translating such characteristics into criteria, and selecting the courses of study which ranked highest as judged according to the criteria by 121 selected judges.

It is evident that ratings on criteria which are found to be common to many courses of study are more significant if the courses are being evaluated for pupils in general, as in the study described. It is equally clear that the ratings are far less significant when the materials are to be selected for a given grade or course. In the latter case it would be necessary to define the criteria with specific reference to the pupils, the local conditions and the objectives of the class under consideration. Since the more specific criteria are those most clearly in the mind of the individual teacher or

[1] Stratemeyer and Bruner, *Rating Elementary School Courses of Study*. Bureau of Publications, Teachers College, New York, 1926.

supervisor who selects the text material, a definite analysis of such criteria is clearly the teacher's responsibility.

Problems. — The service problems examined in this section accordingly involve the definition of criteria pertinent to typical classes in the particular grade or department of the given school. The problems range in scope from the selection of several textbooks as basic materials for a single unit to the simpler problem of selecting one text for the course as a whole on the basis of a single criterion, such as difficulty or interest for a particular class.

Assumptions. — The assumptions to be made in planning a service study of this problem are essentially four.

1. One must assume that the objectives of the course have been defined and reduced to the specific outcomes desired. The desired outcomes should naturally be stated with reference to the pupils directly concerned and with reference to the local conditions affecting the teaching of the course.

2. It must be assumed that the investigator has decided what types of textual material are most likely to produce the desired outcomes.

3. One assumes that the desired types of material exist in one or more available texts.

4. A fourth assumption is that the investigator or other persons whom he consults are competent to identify the desired types of material without having

made an independent analysis of the desired outcomes.

Type Procedure. — The following procedure involves the first three assumptions stated. With regard to the fourth it is assumed that the desired units have been defined and analyzed topically. The procedure is more applicable when conditions permit the somewhat systematic use of two or more texts than when only one text must be chosen. The suggested steps carry the study somewhat beyond the immediate problem; yet all steps are usually both practicable and important.

The Problem. With reference both to the needs of the pupils concerned and to the administrative conditions of a particular school, to select on the basis of adequate criteria one or more textbooks and references for use in a given grade or course from the textbooks and other pertinent literature available.

Abstract of Procedure. 1. Analyze the objectives or desired outcomes of the course and specify the content and form of reading material considered important in obtaining each outcome, — such as clear explanation of facts and principles, entertaining and vivid illustrations, stimulating problems, organization of material to facilitate cross reference, organization of units in text which is consistent with that of other units already organized. The items thus listed constitute criteria for the content of textbooks, when each item is checked against the list of desired outcomes to show which

items are important for which outcomes. (See Specimen Studies, No. 5, Steps 1, 2, 3; No. 6, Steps 1, 2, 3, 4, 5.)

2. Collect texts previously used that contain some of the desired features. Collect other texts recommended by committees of teachers' associations for the given subject, texts found in reputable courses of study, and texts recommended by other teachers of good judgment and specialists in teaching the subject. Select the texts containing the desired subject matter by checking the table of contents of each text to determine roughly how many of the units of the course are represented. (See Specimen Studies, No. 1, Step 1; No. 2, Step 4; No. 3, Step 1; No. 4, Steps 1, 2, 3; No. 5, Steps 3, 4, 5, 6; No. 6, Steps 6, 7; No. 7, Step 1.)

3. Examine professional books and articles proposing criteria for the form of textbooks.[1] Select such of the formal criteria as are directly pertinent to the given course and others that apply to features of textbooks that are important in any course. Add such criteria to those already selected in step No. 1. (See Specimen Studies, No. 1, Step 2; No. 5, Step 8.)

4. Apply to the available texts the criteria thus listed by preparing a table with the criteria on the rows and the texts on the columns. Check the table to determine the criteria met by each book. Then ask other teachers familiar with the course and the classes concerned to check the table in the same way. Take

[1] *e.g.*, Vogel and Washburne, "An Objective Method of Determining Grade Placement of Children's Reading Material," *Elementary School Journal*, XXVIII (1928), 373-381.

such judgments into account in making the final selection. The final selection will naturally be governed by consideration of cost, time to teach, and other factors, which the full list of criteria should represent. (See Specimen Studies, No. 1, Steps 3, 4; No. 2, Step 5; No. 3, Step 4; No. 4, Step 4; No. 5, Step 9.)

4a. (Optional.) Test the adequacy of the selection by collecting data concerning pupils' scores for comprehension and rate of silent reading, vocabulary test scores, mental age, intelligence, previous work in the subject, social status, and home reading facilities. Summarize these data in outline form. Prepare also a brief statement of the features considered important with reference to the desired outcomes of the course. Submit the data (with the statement of features and the selected texts) to specialists in teaching the subject and request their criticism of the books selected with reference to the pupils described.

4b. (Optional.) Try out the selected texts in class to determine relative merit. Determine relative interest by assigning sections of each book relating to the same subject and asking for pupils' preferences. Determine relative difficulty by assigning different text passages on the same topic to pupil groups of approximately equal ability. Test to determine which group has obtained the clearest understanding of the topic. Allow pupils to make their own choice of texts in preparing assignments and note the frequency with which each text is chosen. Devise other simple experi-

ments to compare texts in other important respects as suggested by the desired outcomes of the course. (See Specimen Studies, No. 2, Steps 1, 2, 3; No. 3, Steps 2, 3, 4; No. 5, Steps 10, 11; No. 7, Steps 2, 3, 4.)

4c. (Optional.) Carefully note pupils' reactions to various features of the selected texts by observing pupils at work, by interviewing them to discuss their difficulties, and by testing their command of material learned from the texts independently.

Type Study. — The type-study to be outlined does not utilize criteria obtained from a given school or class, as proposed in the three optional steps, namely, 4a, b, and c. Selection of text materials with reference to a given class is involved in the specimen studies outlined on pp. 174 ff.

Problem: To define adequate and reliable criteria for the selection of text materials in English literature for junior high-school grades.

Assumptions: 1. That the general objectives of the three courses in English literature have been stated and that these have been analyzed to the specific outcomes desired for each course.

2. That the criteria supplied by Stratemeyer and Bruner *Rating Elementary School Courses of Study*[1], pp. 87-92, represent an adequate sampling of criteria to be found in sources mentioned in steps 2 and 3 for courses in English literature, grades 7 to 9.

3. That the units of the course have been defined.

[1] Bureau of Publications, Teachers College, New York City (1926).

Procedure: (See the foregoing Abstract of Procedure for complete list of steps.)

Step 1

"Define criteria in terms of types of text material useful in attaining objectives."

The following example shows a partial list of the objectives, together with the types of reading material considered important in attaining each objective.

OBJECTIVES OF JUNIOR HIGH SCHOOL ENGLISH

From the Report of the Sub-Committee on English in the *North Central Association Quarterly*[1], I (1927), 4.

I. From the standpoint of the social objective.
  A. Acquiring fruitful knowledge
    1. Preparatory to acquiring other knowledge.
      a. Acquaintance with events, persons, movements, customs, and institutions which have determined the progress of mankind.
    2. Knowledge which functions directly in the development of dispositions and discovery and development of abilities.
      a. Biographies and autobiographies of great historical figures.
      b. The social, economic, and political influences that underlie historical movements, conflicts, and institutional developments.
      c. The arts, customs, manners, and occupations of mankind in the past and present.
    3. Knowledge useful in the control of situations of everyday life.
      a. The value of friendships and associations.

[1] Not copyrighted.

b. Acquaintance with accepted social practices showing operation of cause and effect.

B. Development of attitudes, interests, motives, ideals, and appreciations

1. Attitudes: openmindedness, steadiness, kindness, reverence, friendliness, cheerfulness, readiness to cooperate, respect for authority, unselfishness, sympathy, tolerance, patriotism, sympathetic feeling for environment.
2. Interests: the performance of civic duties, securing the common good through individual growth.
3. Motives: desires for service, for the welfare of society, for peace, for the development of social qualities.
4. Ideals: honesty, truth, justice, loyalty, purity.
5. Appreciations: love of the beautiful, ethical values, capacity for vicarious experiences.

II. From the standpoint of the vocational objective.

A. Acquiring fruitful knowledge

1. Preparatory to acquiring other knowledge.
   a. Knowledge of literature concerning occupations.
   b. Knowledge of occupations.
2. Knowledge which functions directly in the development of dispositions and discovery of abilities.

B. Development of attitudes, ideals, and appreciations

1. Desire to improve one's vocational efficiency.
2. Pride in achievement; getting the other person's point of view.
3. Respect for the other person's work — cooperation.
4. Appreciation of standards and values of worthy achievement.

C. Acquiring right habits and useful skills
Habits and skills in:

1. Correct spelling of one's writing vocabulary.
2. Using correctly the simpler marks of punctuation — comma, apostrophe, quotation marks, question mark.
3. Correct oral expression.
4. Using a tone of voice that is pleasing and effective.
5. The formation of sentences.
6. The construction of paragraphs.
7. The writing of a complete theme.
8. Letter writing.
9. Meeting the arguments of others, orally, and in writing.

Activities for developing 1 to 9 above.

Short speeches on topics of the day, oral or written reports from books, oral reports from current magazine and newspaper reading, discussion of cartoons, personal letters and informal notes to real persons, stories and descriptions based upon personal experience and observation; debating, business letters, composition building, sentence structure and punctuation, dramatization, declamation, drill on outstanding difficulties in certain parts of speech with stress on pronouns and verbs.

III. From the standpoint of the leisure time objective.

A. Acquiring fruitful knowledge.

1. Knowledge of travel through acquaintance with purposes of travel; best methods and conveniences of travel; traditions, arts, occupations, and customs of various peoples.
2. Knowledge of the world of nature and her laws.

3. Knowledge of good literature through acquaintance with standard writers.
4. Knowledge of the fine arts through acquaintance with music, painting, architecture, sculpture, decoration, landscaping, and drawing.

Step 2

"Check contents of pertinent textbooks against list of units composing the course."

This step presents no difficulty and is not effectively illustrated in brief space. The process of checking a series of available textbooks against a list of units involves simply listing the units of the course at the top of separate columns of a large sheet of cross-section paper, listing the titles of the texts at the left hand margin, and writing in the proper spaces the page numbers of each text that concern each unit. The completed chart shows plainly not only the relative amount of space devoted to each unit by each text but shows also the degree to which the order of treatment in the text corresponds with the order of treatment in the course of study. See table, pp. 170 f.

Step 3

"From literature on form of textbooks select criteria that apply to form of texts in a given field."

The following basic mechanical elements were selected from literature on the form of textbooks:

1. Clearness and conciseness.

Checking Objectives Against Criteria For Texts

Objectives of the Course						*Desired Content and Form of Text Materials*
IA	IB	IIA	IIB	IIC	IIIA	
√	√		√			Narrative (short stories)
√	√	√	√		√	Biography
√	√	√	√		√	Essays
√	√	√		√		Chiefly or entirely correlated with other subjects
√	√	√	√		√	Sequence of subject matter within a grade determined by:
√		√				*a.* Circumstances of children's needs and interests (i.e., provision made for flexibility)
√		√			√	*b.* Progress from grade to grade and within grade
	√		√		√	*c.* According to differences in children's needs
√	√	√	√	√	√	Effective utilization of pupils' experiences — material introduced through situations familiar to the children
√		√		√	√	Course of study so organized as to provide for individual differences in ability, interest, etc.
						Arrangement and gradation of material according to difficulty (*i.e.*, within grade)

Objectives of the Course						*Desired Content and Form of Text Materials*
IA	IB	IIA	IIB	IIC	IIIA	
√		√			√	Suggested use of varied forms of activities, projects, etc., such as dramatization, debate, etc.
	√		√	√		Respect for the judgment and initiative of the teacher with provision for flexibility of arrangement so as to give the teacher some choice as to subject matter, method, etc.
	√		√			Helpful suggestions and directions for making oral reading effective (*i.e.*, audience reading)
				√		"Suggestions for directing and testing pupils' silent reading abilities and habits"
√			√		√	Suggested standards for checking results of teaching (knowledge tests, indications of attitude formation, habits of study, etc.)
√		√	√	√	√	Use made of scientific studies in determining methods and materials
√		√	√		√	References, basic and supplemental, for children's use
√		√	√	√	√	References to experiments, magazines, and books treating of theory and method—teachers' references

2. Proper methods of emphasizing important phases of work (i.e., use of italics, form of indentation, etc., to stress important items).

3. Attractiveness, usableness — suitability of type, form, etc.

4. Convenience.
   a. Course contains an index.
   b. Course contains a table of contents.
   c. Course has definite page arrangement (i.e., pages numbered).
   d. Course includes blank pages for notations of teacher.

5. Economy of space.

6. Cost.

Step 4

"Obtain criticism of features considered essential in textbooks for the course, the criticism to be based on facts concerning the given pupils."

The step is similar to Step No. 1 and need not be illustrated separately.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

1. List of types of reading needed for the specific units of the course in order to attain objectives.

2. List of criteria for each type of reading material.

[1] The twelve types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row by means of the technique at the top of the column.

3. List of recommended reading materials.
4. Amount of funds available for reading materials.
5. List of reading materials meeting selected criteria.
6. Facts relating to pupils' interests, abilities, opportunities for reading, reading needs, etc.
7. List of reading materials evaluated with reference

SOURCES	TECHNIQUES												
	Analysis	Reading and Recording	Observation	Personal Interview	Question-blank	Check-list	Class Assignment	Experiment	Testing	Group rating	Individual Evaluation	Space count	Sampling
Pupils in the class	....	....	**6, 8, 10**	**6,8,10**	6, 8, 10	6,8,10	6	**7,** 10	**6,**8,10	....	....	..	**12**
Teachers	....	....	....	**1,2,3,** 8,**9,11**	1,2,3,9	5, 8	....	....	.....	**5, 7**	....	..	**12**
Supervisors	....	....	....	**1,2,3,** 8,**9,11**	9	5, 8	....	....	.....	....	**5, 7**	..	..
Other authorities on teaching	....	....	....	.....	**1, 2, 3,** 9, 11	5	....	....	.....	**5,** 7	....	..	..
Subject matter experts	....	....	....	.....	1,2,3,11	5	....	....	.....	5	....	..	..
Administrative officers	....	....	....	**4**	4	....	....	....	.....	....	....	..	..
Parents	....	....	....	**6,** 8	6	6	....	....	.....	....	....	..	**12**
Professional literature													
On special methods	**1, 2, 9, 11**	**3**	....	.....	.....	....	....	....	.....	....	....	..	..
Bibliographies	....	**3**	....	.....	.....	....	....	....	.....	....	....	..	..
Publishers catalogues	....	3	....	.....	.....	....	....	....	.....	....	....	..	..
Texts and courses of study	**1,** 9	**3**	....	.....	.....	....	....	....	.....	....	....	5	..
Research studies on reading materials	**1, 2, 9, 11**	3, 5	....	.....	.....	....	....	....	.....	....	....	..	..
School records	....	**6**	....	.....	.....	....	....	....	.....	....	....	..	**12**

Boldface figures indicate essential steps; others are optional.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES							
	Analysis	Comparison	Summarizing	Classification	Organizing	Individual Evaluation	Frequency Count	Sampling
Objectives and outcomes for the course	**1**	**7**	....	....	....	....	....	....
Topics of the course	**1**	**7**	....	**1**	....	....	....	....
Table of contents of reading materials	....	**7**, 9	....	....	....	**5,7,9**	....	....
Illustrations in reading materials	....	....	....	....	....	**5,7,9**	....	**12**
Teacher and pupil exercises in text	....	....	....	....	....	**5,7,9**	....	**12**
Pupil difficulties with reading materials	....	7, 9	....	6	....	**7**	....	**12**
Pupils' reading abilities	....	**7**	....	....	....	**7**	....	**12**
Pupil preferences for reading materials	....	....	**7**,10, **11**	....	....	**7**	....	**12**
Lists of criteria for reading materials	....	....	**2**	**2**	2	....	....	**12**
Paragraphs relating to each course topic	....	**7**	....	....	....	....	5, 7	**12**

Boldface figures indicate essential steps; others are optional.

to interests, abilities, and needs of the pupils in the class.

8. List of pupil difficulties with the reading material.

9. List of reading materials helpful in overcoming specific difficulties of pupils.

10. List of reading materials preferred by pupils.

11. Suggestions for improving list of selected reading materials.

12. Valid and reliable results.

Specimen Service Studies. — Only such specimens are here presented as suggest noteworthy differences in method of attack or noteworthy adaptations of the type procedure to the somewhat peculiar problems of subjects in which adequate text materials are scarce.

The "Comment on Findings" in this section does not mention by name the texts selected by the various

studies outlined in order to avoid prejudicing other students of similar problems who may have other texts from which to choose.

Reading — Elementary Grades

Problem No. 1: To select the first grade readers best adapted to the needs of children in a given rural district containing fifteen schools.

Major Assumptions: 1. That the first grade children in the given district are ready for reading.

2. That the criteria supplied by authorities on reading adequately represent the needs of the pupils concerned.

3. That the local teachers are competent to apply the criteria to the available reading texts.

Procedure: 1. Obtain a list of the reading texts recommended for the first grade by the specialist in reading of the state department.

2. Obtain criteria for the evaluation of reading texts from the criteria contained in the *Twenty-fourth Yearbook* of the National Society for the Study of Education, Part I, Chapter VII.

3. Submit the readers recommended by the State specialist, together with the criteria, to the local teachers of first grade children, asking each teacher to rate each reader on the basis of the criteria.

4. Select for use the texts which receive the highest combined ratings.

Comment on Findings: 1. The criteria were found

readily applicable by the first grade teachers concerned.

2. The ratings showed close agreement regarding the preferred books and wide disagreement regarding the books not preferred by the majority.

English Literature — Secondary Grades

Problem No. 2: To choose a single text containing representative selections from English poetry, the text to be used as the basis of a unit on poetry in a survey of English literature, eleventh grade.

Major Assumptions: 1. That the major objective of the unit is to develop an enjoyment of good poetry.

2. That enjoyment of good poetry must develop from such poetry as is actually enjoyed by the pupils concerned.

3. That pupils are capable of enjoying poetry found in published anthologies.

Procedure: 1. Assign each member of the eleventh grade class the task of preparing a list of favorite poems. Take pains to make clear that the quality of the poetry is immaterial — any poem may be listed which the pupil actually enjoyed in the reading. Allow at least a week for preparation of the list and make no reference to the number of poems to be listed.

2. Classify the poems reported on all lists according to type. Submit the combined list of poems to the class asking each pupil to check the poems read, to mark with the figure 3 such of the poems read as are most enjoyed, and to mark with the figure 1 such as

are not enjoyed. Rate the other poems checked by marking them 2.

3. Add the figures assigned to each poem by all pupils. Rank the *types* of poetry according to the combined ratings and similarly rank the specimens under each type; also make a separate ranking of poets represented in the selections listed.

4. Collect all brief anthologies of English verse obtainable in school editions. Examine each to determine the emphasis given to the poets ranked highest and to the types of poetry ranked highest.

5. Select the text which gives most emphasis to the preferred poets and the preferred types of verse.

Comment on Findings: 1. There was no evidence that the lists of favorite poems failed to express genuine preferences.

2. The ratings of the combined list of poems clearly indicated preference for narrative, ballad, and humorous verse but did not clearly identify more than two poets as favorites.

English Grammar — Secondary Grades

Problem No. 3: To select a text in English grammar for use in the teaching of English Composition to a ninth grade class.

Major Assumptions: 1. That the most important criterion for the text is the simplicity of the organization for reference purposes, the clarity with which fundamental rules of grammar are explained, and the

adequacy of the exercise materials as a means of developing skill in the application of the rules.

2. That the ease with which pupils can find rules applicable to specific errors is a valid test of the simplicity of organization.

Procedure: 1. Assemble the published texts in English grammar adapted to junior high-school grades. Reject any texts that do not contain material useful in correcting the errors of the type listed for the course. Select by inspection the two or three considered best adapted to the needs of the class.

2. Select four or five pupils who write least correctly and who are about equally intelligent. Give each of the pupils selected a list of typical errors and a different textbook. Ask each pupil to correct each error with the aid of the text and to cite the rules involved by page and paragraph. Allow each pupil the same amount of time for the test.

3. Give each of the selected pupils a different text and repeat the experiment with a different list of errors of approximately the same difficulty as the former list.

4. Compare the results to decide from which text the pupils can obtain the most pertinent material in the same length of time. Estimate the clarity with which fundamental rules are explained by each text and also estimate the adequacy of the exercises supplied for practice in applying the rules. Base the final selection upon all of these estimates.

Comment on Findings: 1. Final selection was largely

influenced by the results of the test of pupils' ability to locate material pertinent to the errors.

2. The variations in the amount and character of explanatory and exercise materials was found to be slight.

American History — Elementary Grades

Problem No. 4: To select from available texts the one text most useful to a sixth-grade class.

Major Assumptions: 1. That the teacher is entirely free to plan and conduct the course as she pleases.

2. That the desired outcomes have been defined for the course and that a course of study, related to the desired outcomes, has been topically outlined.

Procedure: 1. Collect copies of all appropriate texts by writing to standard publishers; also write to experts in the teaching of the social studies for suggestions as to texts not found in publishers' catalogs.

2. Evaluate the texts for content. To do this, check the table of contents against the topical outline of the course. Make a chart on which the topics-to-be-studied are listed across the top of the page at the head of columns; in a vertical adjoining column list the books and then note under each topic the number of pages devoted to it by each text.

3. Discard such texts as are, beyond question, inadequate in material. Rate the others as to their adequacy, by assigning the numbers 1, 2, and 3 to indicate different ranks.

4. Evaluate the illustrations (maps, charts, diagrams, etc.) in the same way for each of the books which has adequate content. Rate them as before.

Comment on Findings: 1. The topical check of each text revealed wide differences in the space devoted to important topics.

2. The reactions of pupils were too personal to be helpful unless more systematically controlled and obtained from each member of the class.

Civics — Secondary Grades

Problem No. 5: To select a textbook for a tenth grade course in community civics.

Major Assumptions: 1. That suitable units for the course have been defined in relation to the objectives and desired outcomes.

2. That conditions require the use of a single textbook rather than a selection of appropriate readings on each unit from several texts.

Procedure: 1. List the units of the course, stated either in terms of principles to be understood or as civic information to be learned.

2. Analyze each unit into the important principles to be understood and outline the topics to be studied in connection with each principle.

3. Formulate one or two problem exercises, a typical assignment that might help the pupil to understand the topics of the unit. Then seek the text which furnishes the subject matter most appropriate to the exercises.

4. Consult several authorities in the field of general social science. Obtain their opinions concerning the best social science text, and check the texts recommended against the text selected in Step 3.

5. Read carefully the descriptions of the newer social-science textbooks in publishers' advertisements in educational periodicals.

6. Write to the publishers for the texts recommended by the authorities and teachers and also those suggested by the advertisements.

7. Examine each book with this question in mind: Does this text present subject matter pertinent to the understanding of each unit and each topic of the course? The books which meet this standard should be laid aside for further consideration.

8. By examination of professional literature and other sources, draw up a score card of criteria for the physical make up of any textbook — such as right size of type, correct letter and line spacing, quality of paper, vividness of illustrations and pictures, etc.

9. Select the texts which best meet the physical standards for any text. Then draw up a special set of criteria for texts in social science, and subject the texts to another examination. Select the two or three which best meet both sets of criteria.

10. If possible, have a number of typical sophomore pupils read the material for a given unit in each text. Ask them to evaluate the texts by answering such questions as the following: Which author gave you the

most interesting account of the unit? Which one presented the unit in the best way? Which book gave you the clearest understanding of the unit? Which book would you choose for a text? Ask for pupils' comments on pictures, illustrations, vocabulary, and other physical features.

11. Finally, select the book which appears to best advantage when all types of evidence are considered.

Comment on Findings: 1. The check against the unit outline and the pupils' reactions afforded the most decisive data.

2. The judgments of experts were least helpful.

References: Lyman, "A Study of Twenty-Four Recent Seventh- and Eighth-Grade Language Texts," *Elementary School Journal*, XXIV (February, 1924); Caverly, Ernest R., "Fundamental Principles Underlying the Preparation of a Score Card for Textbooks in English," *English Journal*, XV (1926), pp. 267-275.

Algebra — Secondary Grades

Problem No. 6: To select an introductory text in Algebra for an eighth grade class.

Major Assumptions: 1. That the majority of the pupils concerned will leave school on completion of the junior high-school grades, i.e., before entering the tenth grade.

2. That the objectives of the course require much emphasis of the life applications to be made of the algebraic principles studied.

3. That the desired outcomes of the course have been defined in terms of five elementary units; namely, the formula, the graph, directed numbers, elementary operations, and linear equations.

4. That teachers are able to anticipate the life situations in which the algebraic operations can be usefully applied by the pupils concerned.

Procedure: 1. Outline each of the units in detail, by listing typical operations to be assigned in the study of each unit.

2. List in parallel columns as many familiar life situations as possible in which the pupils concerned are likely to find useful applications for the operations outlined.

3. Interview a selected group of expert teachers and adult members of the school community. Ask each person interviewed to examine the operations in connection with each unit and to suggest other useful applications than those already listed. Record only those "applications" that clearly involve one or more algebraic operations or principles.

4. Combine the applications suggested by all persons interviewed and classify them according to type, without reference to the algebraic operations.

5. Submit the classified list of operations to the selected judges and ask each to check those considered highly important to the pupils from vocational and social considerations. Rank the applications in the order of relative importance as indicated by the checks.

6. Assemble representative elementary textbooks in algebra and check the illustrative and exercise materials in each to determine the extent to which the important applications are explicitly treated.

7. Other features of the books containing the required units being equal, select the text giving most emphasis to the important applications.

Comment on Findings: 1. The procedure proved effective in that the texts consulted showed wide variation in their emphasis of the applications specified.

2. The teachers rating the applications for relative importance showed marked disagreement except in the case of the more obvious and formal applications—e.g. "understanding mathematical references in general reading."

References: E. L. Thorndike, *The Psychology of Algebra;* Smith and Reeve, *The Teaching of Junior High School Mathematics.*

Hygiene — Elementary Grades

Problem No. 7: To select the one text in hygiene of most interest to the members of a fourth grade class.

Major Assumptions: 1. That the pupils' interest in hygiene is important as a means of developing proper health habits.

2. That pupils will choose the most interesting text if they are acquainted with the texts available and are permitted to make their own selections.

Procedure: 1. Obtain several copies of each of the

textbooks on hygiene that appear on the list prepared by the state department.

2. Make two or three reading assignments in each of the books in turn, as a means of acquainting the pupils with each text.

3. Prepare from ten to twenty assignments that may be covered about equally well by material contained in any one of the texts. Allow each pupil to read whichever text he prefers.

4. Select the most popular text as indicated by the number of pupils who choose each book and the reasons for the choice.

Comment on Findings: 1. Since all reading was confined to the classroom, the teacher could talk with pupils and discover when a book was chosen merely because it came first to hand and when the book was chosen with some consideration of the other books.

2. The test was decisive because over half of the pupils clearly preferred the same one of the seven books available.

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5. ADAPTING PRESCRIBED MATERIALS TO A GIVEN CLASS

(Type Problem I D)

The problems in adapting and revising a course that has already been worked out in detail are among the most frequent and the most serious of the curriculum problems met by teachers in service. Perhaps it is for this reason that they are seldom attacked systematically.

One way of evading the problem is to say that the adaptation of prescribed materials is a problem of teaching method and not a problem of subject matter at all. It is difficult, of course, to draw a hard and fast line between subject matter and method. Exceptions to any definition can be found in certain subjects. It is safe enough, however, to assume that any teaching process involves both subject matter and method to some extent. Hence no ingenuity in presenting inappropriate materials by skillful methods can produce as good results as the same ingenuity and teaching skill applied to more appropriate materials. It is consequently an evasion to suggest that excellence of teaching method can render the improvement of prescribed materials unnecessary.

In some subjects and schools a prescribed course may, perhaps, be so excellently constructed as to re-

quire no important modification until its materials become out of date. A significant part of the problem defined is thus to determine whether the given course requires modification or not, and if it does, to determine at what points and to what extent the changes are required.

There is an important difference between adapting the course to a *typical* class, as discussed in Section 3 of this chapter, and adapting the course to a *particular* class. The particular class is obviously the more variable. It seems possible, however, to make certain generalizations even with regard to the needs of particular classes. It may be stated, for example, that the peculiarities of previous training or of interest in certain phases of the subject should in part determine the changes required. When such peculiarities are noted in a significant proportion of a class, some change of emphasis in the prescribed materials is in order. Another fact is that the topics, exercises, and problems, sometimes written into a course of study, tend toward abstract principles and factual matter that needs often to be interpreted by supplementary problems and illustrative activities. The latter depend for their effectiveness upon the interests and experience of the given pupils and are therefore of merely temporary value. For this reason they should seldom be written into the course of study but should to some extent be prepared anew for each class. It is thus important to define a procedure whereby formal rules

and factual matter may be supplemented by life situations and problems that give them meaning for the particular class. In very general terms it may be urged that courses organized on the basis of principles — e.g., grammar, science, history — need to be supplemented by problem-situations to which the principles can apply. Courses organized on the basis of formal problems — e.g., mathematics, practical arts, civics, and general science — need to be supplemented by related problems from the pupils' own experience and by the concrete situations in which such problems arise.[1]

Problems. — The problem of the present section thus involves an evaluation of the content of the prescribed units with reference to the pupils' abilities, interests, and needs. If the contents need to be modified, the modification may require either (1) changing the emphasis of the units themselves, (2) changing the emphasis of the contents of particular units, (3) substituting new materials for the contents of certain units as prescribed, or (4) preparing supplementary materials to add meaning to the prescribed materials.

Assumptions. — An investigation of the problem involves the assumption that objectives have been defined for the course in terms of desired outcomes and with reference to the needs of typical classes. It must

[1] See D. Waples, "Techniques of Analysis in Constructing the Academic High-School Course," *Journal of Educational Research*, XIII (1926), 1-10.

also be assumed that the course has been outlined by topics, that the topics are grouped with some approach to a unit organization, and that text materials have been chosen for the study of each unit or topic. These assumptions are implied in any study of the service problem stated.

Important assumptions are also necessary to support the procedure to be recommended. One must assume for example that the teacher concerned is competent to distinguish between materials that are inappropriate for the pupils and materials that are simply hard to learn. Other critical factors in solving the problem are the ability to interpret correctly the data regarding the members of the class and the ability or scholarship required to select new materials that are superior to the old. It must accordingly be assumed that the investigator possesses these abilities or has access to others who possess them.

Type Procedure. — The following procedure is more complicated than others. It requires, and will probably justify a somewhat more careful study. A briefer outline has been found to convey the central idea more clearly but causes confusion by concealing the technical problems involved. The procedure must therefore depend upon the Type Study and the Specimen Outlines for the concrete examples needed to make each step clear.

The Problem. To evaluate the content and organization of the units in a prescribed textbook or course of

study with reference to the abilities, interests, and needs of a particular class, and to modify the content and organization where necessary.

Abstract of Procedure. (Optional.) a. By means of standardized and improvized tests, questionnaires, and other techniques collect facts about the pupils which may suggest how the prescribed materials should be modified so as better to meet their needs. In secondary grades such modifications are usually suggested by pupils' statements concerning the length of time each intends to remain in school, concerning out-of-school experiences related to the course, concerning present vocational ambitions and other active interests, and concerning the nature of previous school work in the given subject. In elementary grades certain pertinent facts may be obtained by standardized tests of intelligence and of attainment in the given subject. The test results may well be checked by interviewing the pupils who obtain conspicuously low or conspicuously high scores, to determine their interest in activities related to the subject. (See Specimen Studies, No. 1, Steps 1, 2, 3; No. 3, Step 1; No. 4, Step 1; No. 7, Step 3.)

1. With reference to data concerning the abilities and needs of the class, rank the specific objectives of the course in order of relative importance. Rank also the separate units or major topics of the prescribed course of study, at least to the extent of checking the units that are considered least essential to the attain-

ment of the most important objectives. (See Specimen Studies, No. 1, Step 1; No. 2, Step 1; No. 4, Steps 2, 3; No. 7, Steps 1, 2, 3, 4, 5.)

2. Adapt the course more closely to the needs of the class by considering the value of each major topic of the course in turn. In connection with each topic ask the question "Why should this class study this topic?", then write down the specific reasons that are offered or the specific situations in real life in which the typical pupil has occasion to use the material. Submit the list of topics with the reasons for studying each of them to other teachers and supervisors of the subject, asking each to indicate which reasons or situations are most useful to the given class and which should be omitted, if any. Also examine appropriate literature for life situations to which the topics apply. Summarize the judgments and list the situations considered useful in teaching the topic. (See Specimen Studies, No. 2, Steps 2, 3.)

3. Supplement the foregoing step by determining, for the topics most difficult to teach, the situations in which pupils are best able to apply the topic to their familiar experiences. This involves collecting situations related to the topic, asking representative pupils to state how the situation applies to the topic, and then rejecting the situations not understood. Obtain suggestions from other teachers regarding additional situations, and texts, and supplementary materials that are needed by the given class to understand the topic

prescribed. (See Specimen Studies, No. 1, Steps 2, 4; No. 5, Steps 1, 2, 3, 4, 5, 6; No. 6, Steps 1, 2, 3; No. 8, Steps 1, 2, 3, 4; No. 9, Steps 1, 2, 3, 4; No. 10, Steps 1, 2, 3, 4, 5.)

3a. (Optional.) Revise the titles of the units or major divisions of the course whenever the revision of subordinate topics makes the former titles inappropriate. The title is significant in that it should express the central problem or principle of the unit. Submit the revised list of unit titles to the pupils and ask each to write a brief statement of what he understands the title to mean, or obtain the statements by personal interview. Revise the titles that are not correctly interpreted and test again until titles are found that are clear.

3b. (Optional.) Submit the revised list of topics to competent critics together with the list of unit titles. Ask each critic to index the topics to show what topics are considered most appropriate to each title. Summarize the returns and where necessary revise the classification of topics by units.

4. Retain the topics of the original course that are found to have a useful meaning to the class. Where the original topics are not clearly intelligible, do not contribute directly to the objectives, or contain subject matter of slight intrinsic importance to the given class, omit them and substitute other topics suggested by the various sources consulted. (See Specimen Studies, No. 2, Step 5; No. 3, Steps 2, 3; No. 4, Step 4;

No. 5, Steps 5, 6; No. 7, Step 6; No. 8, Step 4; No. 9, Step 4; No. 10, Steps 5, 6.)

5. Try out the reorganized units and topics and revise them where necessary to make them more valuable and meaningful to the class. Such revision often requires no more than a shift of emphasis from textbook information to problems involving the information. A course of study often contains units that are important but too hard for pupils to grasp because they consist of abstract principles. Such units may become clearly intelligible if pupils are introduced to them by means of a series of problems or life situations that come within the range of the pupils' experience but which cannot be fully understood without the textbook information. (See Specimen Study, No. 2, Step 5.)

Type Study. — The procedure will be illustrated by a study[1] confined to one topic of a course that is organized according to one textbook, namely, Pieper and Beauchamp, *Everyday Problems in Science.* Since the study is concerned with the evaluation of only one topic with reference to a given class, it does not illustrate the steps that have to do with evaluating the complete list of topics composing the course. For explanation and illustration of the steps omitted in the type study, the reader is referred to appropriate sections of Chapter VI. The more troublesome steps of

[1] Conducted by Elizabeth Springstun, Department of Education, University of Chicago.

the procedure involve the analysis of individual topics that are found to be important and yet difficult to teach to a given class. The illustration is accordingly confined to these steps.

Problem. To adapt a topic of a first year course in general science to the needs of a given class by determining and evaluating the situations most useful in teaching the topic.

Assumptions. 1. That the objectives defined by the authors of the prescribed text are appropriate to the given class and that the topics discussed in the text are appropriate to the objectives.

2. That the topics discussed in the text have been rated for general value by the instructor of the course and by other competent judges.

3. That the topic "why we eat food" is shown by the ratings to rank high in importance and is found by the instructor to be among the topics most difficult to teach to the given class.

4. That the topic may be taught to better advantage if situations are found in which the pupils are able to recognize the relation of the topic to their familiar experience.

5. That other important topics which prove difficult to teach will be studied in the same way so that the course as a whole will be adapted to the needs of the class by closer relation of the topics to the pupils' experience.

Procedure. (See the foregoing Abstract of Procedure for complete list of steps.)

Step a

"Collect facts concerning pupils to suggest needs to which materials should be adapted."

It was considered necessary to collect only two kinds of data regarding the pupils of the given class; namely, their intelligence quotients and their standing on the prescribed work of the unit. These data were used merely as a basis upon which to make a sampling of representative pupils for the interviews described in Step 3. The I. Q's were useful in selecting pupils to represent the different levels of intelligence within the given class. The standing on the prescribed work of the unit was indicated by the number of problem exercises correctly solved at the end of the first week. The largest number of problems solved by any one pupil at this time was ten. Five pupils were selected for interview on the basis of these data as follows:

PUPIL	AGE	I. Q.	NO. OF PROBLEMS RIGHT	RATE OF WORK
1	12	129	10	fast worker
2	12	135	9	average
3	13	125	6	slow
4	12	122	10	average
5	13	111	9	average

Step 1

"Rank specific objectives and separate units in order of relative importance."

The step was omitted on the basis of Assumption 1. See Chapter VI, Sections 1 (Analysis) and 6 (Check list) for illustration of the techniques involved. The topic "Why we eat food" was chosen for special study on the basis of Assumptions 3 and 4.

Step 2

"Submit list of situations, in which the course is presumably useful to the pupils concerned, to a competent jury — the situations to be rated for difficulty and importance."

Twenty-seven life situations related to the topic "Why we eat food" were obtained from teachers of general science and other subjects by personal interview, also from textbooks on science and on home economics. The situations were then examined by three other teachers who were asked to rank the situations in order of difficulty and to add any other situations considered more suitable. No situations were added. The list of situations follows, stated in question form:

1. What were the reasons given in your book for eating food?

2. Do you see any connection between the reasons you have given and the following? Bears find a convenient hole to rest in during the winter and eat no food during that time. How do they keep alive?

3. Do you see any connection between the reasons given and the following question: Which boy will eat more — a boy who plays all afternoon or the one who reads all afternoon?

4. Can you explain why people can go many days without food?

5. Some people stand cold better than others. Why?

6. Do you see any reason why we should eat lightly in summer?

7. Why do we eat meat in winter?

8. Why do sick people need special diets?

9. Fat people also need special diets. Why?

10. How does food help in preparation for strenuous muscular activity?

11. How does food help if you are losing weight?

12. A camel is able to go many days without food. Why?

13. Do you see any resemblance between food and fuel?

14. Why is a boy always hungry after he plays?

15. Who is likely to get hungry more often—a child or a grown person?

16. Do you see any connection between food and the fact that we put fertilizer around trees in the spring?

17. Do you see any reason why they are putting fertilizer on the midway now?

18. Before the beaver hibernates for the winter his tail becomes very fat. Why is this?

19. How does the ground hog manage to sleep all winter?

20. Why do you suppose farmers put their pigs in pens for some time before selling them?

21. Do you see any connection between food and the fact that trees are small and dwarfed in the North?

22. Do you see any reason why Eskimos should eat meat and fat?

23. Why do people in the tropics live on fruits principally?

24. Who do you think would eat the more, a man who digs ditches or a man who works in an office?

25. Why do you think some trees bear larger fruit than others?

26. Snakes coil up and sleep all winter. How can they do this?

27. Why is it best to go to bed when recovering from an illness?

Step 3

"Interview selected pupils to determine the relative difficulty of the situations."

The relative familiarity of the situations to the class was determined by interviewing the five selected pupils individually. Each pupil was asked each of the 27 questions and the replies were recorded. Questions not correctly answered were asked again at later interviews until each pupil had answered each question correctly. The number of pupils requiring more than one interview to answer a given question was thus an index of the difficulty of the question. The results of the interviews were as follows:

PUPIL	QUESTIONS NOT ANSWERED CORRECTLY AT		
	FIRST INTERVIEW	SECOND INTERVIEW	THIRD INTERVIEW
1	none		
2	none		
3	No. 15	No. 15	none
4	Nos. 1, 8, 15, 16, 17, 27	Nos. 1, 8, 15, 27	none
5	Nos. 1, 8, 27	Nos. 1, 8, 27	none

On the basis of these results the situations presented by questions Nos. 1, 8, 15, 16, 17, and 27 were considered likely to prove confusing to the pupils of normal intelligence and normal ability for the given class in respect to the unit chapter on Foods. These situations accordingly were not introduced until the unit was understood as such. The difficult situations were then presented on account of their intrinsic importance rather than as a means of explaining the basic principles. In view of the number of situations remaining, no attempt was made to find substitutes for the situations omitted.

Step 4

"Omit topics found meaningless and unimportant in themselves."

This step did not result in the omission of any topics contained in the text.

Step 5

"Try out and revise the reorganized units."

The situations thus collected and evaluated for the given unit were found to help considerably in making the important though commonplace topic appear important to the given class.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

[1] The twelve types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

SOURCES	TECHNIQUES														
	Analysis	Reading and Recording	Observation	Personal Interview	Group Conference	Diary	Question-blank	Check-list	Class Assignment	Experiment	Testing	Group rating	Individual Evaluation	Space count	Sampling
Pupils Members of the class	...	....	**1, 2**	**1, 2**	.....	1, 9	1, 2	1, **2**	**1,** 2	**11**	**1**	..	....	..	**12**
Members of previous classes	...	....	...	3, 4, 9	.....	9	3, 4, 9	3, 4, 9	....	..	..	6	....	..	12
Teachers	...	....	...	3, 4, 9	**3,** 4	...	3, 4, 9	3, 4, 9	....	..	..	**6**	....	..	**12**
Supervisors	...	....	...	**3,** 4, 9	.....	...	3, 4, 9	3, 4, 9	....	..	..	..	6	..	..
Other authorities on teaching	...	....	...	.....	.....	...	3, 4	**3,** 4	....	..	..	**6**	....	..	..
Subject-matter experts	...	....	...	.....	.....	...	3, 4	3, 4	....	..	..	6	....	..	..
Parents	...	....	9	**2,**3,4, 9	.....	...	2,3,4,9	2,3,4,9	....	..	..	6	....	..	**12**
Occupational groups	...	....	9	3, 4, 9	3, 4, 9	...	3, 4, 9	3, 4, 9	....	..	..	6	....	..	12
Community members in general	...	....	9	3, 4, **9**	3, 4, 9	...	3, 4, **9**	**3, 4,** 9	....	..	..	**6**	....	..	**12**
Professional literature on the curriculum	3	....	...	.....	.....	...	.....	.....	....	..	..	..	....	..	..
on special methods	3, 4	....	...	.....	.....	...	.....	.....	....	..	..	..	....	..	..
Bibliographies	...	10	...	.....	.....	...	.....	.....	....	..	..	..	....	..	..
School-supply catalogues	...	10	...	.....	.....	...	.....	.....	....	..	..	..	....	..	..
Texts and courses of study	3,4, 10	....	...	.....	.....	...	.....	.....	....	..	..	..	....	6	..
Research studies on children's interests	...	6	...	.....	.....	...	.....	.....	....	..	..	..	....	..	..
Popular literature	4, 9	....	...	.....	.....	...	.....	.....	....	..	..	..	....	..	..
School records	...	**1, 2**	...	.....	.....	...	.....	.....	....	..	..	..	....	..	**12**
Written work of pupils	1	....	...	.....	.....	...	.....	.....	....	..	..	..	....	..	12
Local environment	...	....	**9**	.....	.....	...	.....	.....	....	..	..	..	....	..	12

Boldface figures indicate essential steps; others are optional.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES							
	Analysis	Comparison	Summarizing	Classification	Organizing	Individual Evaluation	Frequency Count	Sampling
Specific objectives of the course	....	**3, 10**	....	....	**5**	**3**	....	....
List of units in the outline of course	**7**	**10**	....	....	**5**	....	....	....
List of pupil activities in the course	....	10	....	**7**	**5**	**4**	....	**12**
List of topics in the course	....	**10**	....	**7**	**5**	**4**	....	....
Specific difficulties of pupils	....	10	**6**	**7**	....	....	**6**	**12**
List of materials for the course	....	**10**	....	**7**	**5**	**4**	....	....
List of text and reference reading	....	**10**	....	**7**	**5**	**4**	....	....
Pupils' intelligence and abilities	....	**3, 10**	....	....	....	....	....	**12**
Pupils' interests and ambitions	....	**3, 10**	....	....	....	....	....	**12**
Community activities, problems and materials related to the course	....	**3, 10**	....	....	....	....	....	**12**

Boldface figures indicate essential steps; others are optional.

1. Facts concerning the pupil's intelligence, ability in the subject, activities, and difficulties related to the subject.

2. Facts concerning the pupil's interests, educational and occupational prospects and ambitions.

3. Objectives of value to the pupils of a given class.

4. Topics, materials, activities, and exercises of value to the pupils of the given class.

5. Revised unit outline for the course.

6. Most important objectives, topics, activities, interests, difficulties, and materials related to the course.

7. Topics, materials, activities, and exercises related to each unit.

8. Groups of pupils more or less homogeneous with reference to ability, needs, and interests.

9. Community activities and problems relating to the course.

10. List of references and other materials appropriate for the revised course.

11. Suggestions for improving the revised course.

12. Valid and reliable results.

Specimen Service Studies. — The following outlines are much alike in procedure yet each subject involves certain changes that deserve careful examination.

Reading — Elementary Grades

Problem No. 1: To adapt the phonic combinations prescribed for first grade reading to the needs of a particular class.

Major Assumptions: 1. That the ability to use phonics is essential in developing independence in word recognition, which is a major objective of primary reading.

2. That only those phonic combinations should be taught which are helpful in learning to recognize the words read in the primary grades.

3. That a list of phonic combinations is prescribed for first grade pupils to learn.

Procedure: 1. Record on cards all words which pupils have difficulty in pronouncing during the oral reading class.

2. If the word is partly pronounced or another word is pronounced in its place, indicate the portion of the word causing confusion by placing parentheses around this part of the word.

3. During the silent reading period have each pupil

either lightly underline the words he is unable to recognize or raise his hand to ask for assistance. Then, have the pupil attempt to pronounce the words and record as before the portions of the words causing confusion.

4. Determine the frequency of each confusing phonic combination each week. The materials for phonic training during the week are the phonic combinations giving most frequent difficulty that week.

Literature — Secondary Grades

Problem No. 2: To select the particular classics to be read for each unit of a twelfth grade course in A Survey of English Literature, when the units represent different types of literature and when the teacher is allowed to select any one classic from the list recommended by the college entrance examination board for each unit.

Major Assumptions: 1. That any classic mentioned in the official list is equally useful as a means of introducing the type of literature it represents and hence equally useful from the standpoint of the desired outcomes represented by each unit.

2. That selection of the one classic for each unit should be based primarily on its interest to the class as a whole.

Procedure: 1. Tentatively select for each unit the one classic considered likely to make the strongest appeal to the members of the particular class. The

selection will be entirely subjective but will take account of previous success in teaching each classic and will be guided by what the teacher knows about the reading tastes of the pupils concerned.

2. Check this tentative selection by interviewing and corresponding with other teachers of twelfth grade literature to obtain their preferences, by consulting the findings of the various studies of high-school pupils' reading interests, and by noting the frequency with which the selected classics appear in published courses of study constructed by experts.

3. Consider any local conditions that may render certain classics more interesting than others — for example, classical dramas scheduled for presentation in local theatres, illustrative materials regarding certain poets in the local museum, et al.

4. Determine which members of the class have previously read the classics and secure frank reactions from these pupils. Where two or three classics appear equally suitable for the same unit, select representative pupils to examine them and report their preferences.

5. Revise the tentative selections in the light of the evidence gathered and teach them experimentally. Record such reactions of individual pupils as may tend to improve the selections when the course is given again.

Comment on Findings: 1. In the case of two or three units, the most famous classics were less popular on that account. Pupils had heard them mentioned

disparagingly by other pupils and hence regarded them with suspicion.

2. The more famous classics were selected for use on the basis of other teachers' experience and from data on pupils' interests. The selections proved interesting when the initial prejudice had been overcome.

References: Allen and Abbott, "Reading Tastes of High-School Pupils"; Anderson, "Preliminary Study of Reading Tastes of High-School Pupils" (*Pedagogical Seminary*, December, 1912); Crow, "Evaluation of English Literature in High School" (*English Journal*, June, 1921); Hugh, "Survey of Reading Interests of Pupils of the Madison (Wisconsin) High School."

Spelling — Elementary Grades

Problem No. 3: To adapt a prescribed spelling text to differences in spelling ability of a fourth grade class?

Major Assumptions: 1. That the text contains the words most commonly and universally used, arranged in order for most economical learning.

2. That the words listed in the spelling book for the grades following the fourth should not be given in the fourth grade to provide a more extended spelling list for the superior pupils but that these pupils should be given other words outside the prescribed list.

Procedure: 1. During the first week of each month test the pupils on each word in the list prescribed for the entire month. So arrange the tests that the pupils will be tested twice on each word.

2. Select for each pupil as his minimum basic spelling list those words which he did not spell correctly twice. The superior pupil may have in this list only two or three words while the inferior pupil may have 75 or 80 words.

3. Add enough words to each basic monthly list to keep each pupil working at his best rate by selecting words from two additional sources; (a) Add the words misspelled by the pupil in his written work. (b) Check the Thorndike Word List against the prescribed spelling text. Select those commonly used words from the Thorndike list which are not found in the spelling book for any of the grades and which are found by test as being misspelled by the pupil.

Comment on Findings: 1. The basic monthly list was supplemented chiefly by words misspelled in pupils' free compositions. The Thorndike list supplied very few.

2. Pupils testing satisfactorily were allowed to read silently during the time given other pupils to write the words assigned for study.

English Grammar — Elementary Grades

Problem No. 4: To select from the rules contained in a prescribed textbook on English grammar the rules to be taught to a given sixth grade class.

Major Assumptions: 1. That the course of study requires the teaching of some rules as such.

2. That the rules learned by pupils should help them

to avoid their most frequent and serious errors in spoken and written language.

Procedure: 1. If the language errors of the class have been collected and evaluated, use the most frequent errors as criteria for selecting portions of the text for emphasis. If the errors have not been collected, give the class a battery of diagnostic language tests. Select the errors common to most of the pupils in the class as criteria for selecting the portions of the text to be emphasized.

2. Determine on the basis of personal judgment for each of the errors selected, what statement of proper usage best applies to the case. List the preferred statements.

3. Mark each section of the prescribed text which in essence (subjective judgment) defines the statements listed in 2 above.

4. Select from each of the marked sections the written and oral exercises which demand the use of the specific language skills found lacking. Emphasize such exercises and the corresponding sections of the text.

Comment on Findings: 1. The collected errors were about evenly divided between grammatical errors and colloquial slang.

2. Textbook exercises were readily selected to explain the correction of the grammatical errors. The slang expressions were corrected by daily word drills.

American History — Elementary Grades

Problem No. 5: To adapt a sixth grade history text, which follows a chronological sequence, to a proposed course of study dealing with social problems of contemporary significance.

Major Assumptions: 1. That the function of history is to provide an understanding of contemporary social problems by presenting the past conditions from which the problems have developed.

2. That this function is best realized when the history course is organized with reference to the contemporary problems rather than with reference to chronological periods of history.

3. That the contemporary problems upon which the history should bear have already been collected.

Procedure: 1. Ask each sixth grade teacher in the school to select, on the basis of personal judgment, the paragraphs which provide material helpful in understanding the first contemporary problem. Follow this procedure with each problem in turn.

2. Arrange a group meeting of the teachers and select the textbook references applying to each problem on the basis of group judgments.

3. Have each teacher read through the selected references and note the omissions to be supplied to give connected text material.

4. Have each teacher attempt to supply the omissions by indicating "connective tissue" — i.e., by out-

lining the topics or facts needed to make the materials coherent.

5. Arrange another group meeting to decide which of the connective topics are to be retained as part of the course.

6. Have the references and connective topics mimeographed in sequential order for pupils' use.

Comment on Findings: 1. The contemporary problems selected were mainly concerned with social conditions such as tenant farming and absentee landlordship, the development of prominent industries and their social effects, et al.

2. The historical data applicable to such contemporary conditions represented approximately half of the text material. The connective topics constituted about one-third of the remaining half.

Geography — Elementary Grades

Problem No. 6: To adapt the country-by-country and state-by-state arrangement of a sixth grade geography text to a proposed course of study organized around the geographic factors affecting social and economic life.

Major Assumptions: 1. That the function of sixth grade geography is to develop an understanding of the relation of such geographic factors as climate, accessibility, et al., to social and economic life.

2. That these relationships are best taught by studying illustrations organized around each factor rather

than by studying a group of facts organized around each of the countries or states.

3. That the significant geographic factors to be studied have already been selected.

Procedure: 1. Assign a portion of the geography text to each of the pupils. For example, three pupils may be assigned that part of the text dealing with the New England states, another group may be assigned the Central Atlantic States, etc.

2. Take the first factor, climate, and ask each pupil to go through his portion of the text to find any references to climate. Record the references and copy the statements on cards. Proceed with each of the other factors in the same way.

3. Examine the cards on climate and select the references to statements which show the significant relation between climate and life. Deal with each of the other factors in the same way.

4. Organize the references pertaining to each factor in the form of units. Devote the class period largely to the study of references bearing upon the unit factor and to discussion of the various references assigned.

Comment on Findings: 1. The factors selected were found to provide for virtually all of the text material. When pupils failed to note the bearing of any significant passage upon a given factor, the teacher supplied the reference.

2. The unit organization added much to class interest in the assignments, since each pupil group was

easily encouraged to find more and better references than other groups in the various chapters related to the unit.

Algebra — Secondary Grades

Problem No. 7: To determine the relative difficulty and importance of the units composing a prescribed course in ninth-grade algebra and to determine the emphasis each unit should receive in accordance with the findings.

Major Assumptions: 1. That the course must meet the needs both of pupils intending to enter college and of others.

2. That among units of equal importance the more difficult should receive the greater emphasis.

3. That college students are competent to state the algebraic principles of most importance in college courses for which algebra is prerequisite.

4. That men and women who have studied algebra in high school and who have not attended college are competent to state the algebraic principles of most importance in their own occupations.

Procedure: 1. Outline the course as taught, with illustrations in parallel column of specific mistakes which pupils make most frequently. Ask pupils to rank units in order of difficulty.

2. Interview college students and secure ratings of these difficult units to determine which of the more difficult units are considered essential to success in

the college courses for which high-school algebra is prerequisite.

3. Classify pupils into college and non-college groups on the basis of their intentions, as reported on a question-blank prepared for the purpose.

4. Submit the difficult units to men and women engaged in occupations which (1) require some knowledge of algebra and which (2) require no knowledge of algebra. Ask the judges to rate the units in terms of the frequency with which each unit is useful to them.

5. Combine the ratings to select the units judged as of most importance for pupils of both college and non-college groups.

6. Distribute time in accordance with the ratings, i.e., give most time to the most important of the more difficult units.

Comment on Findings: 1. The units considered by college students to be essential for college courses in mathematics and science were not considered important by the other groups of judges.

2. The units selected for special emphasis were the three units considered most important by both groups of judges; also the two units rated as most important by each group separately.

General Science — Elementary Grades

Problem No. 8: To determine the proper emphasis to be given to the units of a prescribed course in general science for the eighth grade.

Major Assumptions: 1. That the pupils' understanding of the units depends upon the extent to which they are related to science problems within the pupils' experience.

2. That the parents of the pupils concerned are able to state which of a series of problems have been experienced or may be illustrated in their homes.

Procedure: 1. Under the appropriate units of the course, as defined by chapters of the textbook, list and illustrate the typical science problems in terms of household activities and other familiar situations.

2. Examine other texts in general science, published courses of study, and the findings of curriculum studies to obtain additional problems.

3. Submit the classified list of problems to the parents of each class entering the course. Request both parents of each pupil to check such of the problems or illustrations as they believe the child is familiar with or such as can be readily observed in the home or in the locality.

4. Determine the frequency with which the items under each unit are checked and emphasize the chapters accordingly. Select the problems most frequently checked for use in laboratory demonstrations and home project assignments.

Comment on Findings: 1. The parents responded well. Interviews were necessary in some cases. All parents showed considerable interest.

2. The chapters not related to familar situations were obviously more theoretical and hence were properly subordinated, in an introductory course, to the other chapters dealing with matters about which the pupils possessed some direct information.

Chemistry — Secondary Grades

Problem No. 9: To determine practicable modifications of the content prescribed for an eleventh-grade course in chemistry with a view toward increasing its value for a given class of whom a majority do not intend to enter college.

Major Assumptions: 1. That pupils intending to enter college should be introduced to the principles that define the structure of chemistry as a subject.

2. That pupils not intending to enter college will derive greater benefit from the study of the chemistry involved in the local industries and in the activities of everyday life, when such chemistry has not been taught in previous general science courses.

3. That administrative conditions require both groups of pupils to be taught in the same class.

4. That because of its obvious importance to the pupils of the given locality, the unit "Iron and Steel" should be analyzed first to develop a reliable procedure capable of application to the other units of the prescribed course.

Procedure: 1. Analyze the principles contained in

the textbook which relate to the manufacture of steel by listing as many applications of each principle as are represented by operations in the local steel mills.

2. Submit the list of applications to representatives of the steel industry, including foremen, to obtain judgments regarding the relative importance of each application to an understanding of the process as a whole. Ask also for additional applications.

3. Submit the same list of applications to teachers of chemistry and to adults who have studied chemistry but have made no vocational use of it. Ask both groups to rate the applications for their importance in every-day life. Ask also for additional applications.

4. Combine the ratings and select the items in the prescribed course of study which relate to the applications checked by each group of judges as important. Emphasize such items in assigning the unit to non-college pupils, and supply additional materials that are needed to explain the applications stressed.

Comment on Findings: 1. The applications of this particular unit were rated so uniformly high that no important help was obtained from the ratings in deciding what principles might be omitted for the non-college group. Many new applications, however, were obtained from the interviews. It was accordingly decided to teach the unit on the basis of the applications. These were grouped according to the following topics:

occurrence of iron, varieties of iron, blast furnace, cast iron, wrought iron, steel, temper, output, rust proofing iron, steel alloys, salts of iron, ink, and blue prints.

2. The specific applications of each topic were assigned as problems to the non-college pupils who were required to explain the processes involved in each application — e.g., the construction of a Bessemer converter. The college pupils were required first to study the principles by means of laboratory experiments, then to criticize the explanations worked out for the applications by the non-college group.

Domestic Science — Secondary Grades

Problem No. 10: To improve the prescribed ninth-grade course in Food Preparation by relating the instruction to the principles taught in ninth-grade general science to the same pupils.

Major Assumptions: 1. That the objectives for the course in Food Preparation emphasize an understanding of the physical, chemical, and biological principles involved in the preparation of foods.

2. That the number of basic principles common to the two ninth-grade courses is sufficient to justify a somewhat systematic cross reference.

Procedure: 1. Request the teacher of the course in general science to list the major principles taught in the course.

2. List the essential principles or facts that are

taught in connection with each unit of the course in Food Preparation.

3. Compare the two lists and check the science principles that serve to explain the essential facts regarding food preparation.

4. Submit the list of facts regarding food preparation to the teacher of science and ask him to check the facts which illustrate significant principles taught in the science course.

5. Add any facts to the course in food preparation that are relevant to one or more of the prescribed units and that relate to the principles suggested by the teacher of science in addition to the principles checked in Step 3.

6. Reorganize the units by outlining the important facts in connection with the major operations of food preparation; then by listing the science principles in connection with the facts each explains. Teach each unit by assigning the operations as projects, the facts as collateral reading, and the principles as material for class discussion.

Comment on Findings: 1. The science principles related to the significant facts in food preparation represented a significant proportion of the principles taught in the science course as a whole. Emphasis of the common principles apparently increased interest and understanding in both courses.

2. An example of the unit organization with reference to one cooking operation is as follows:

OPERATIONS IN PREPARING FOODS	FACTS AND PRINCIPLES TO BE TAUGHT	SCIENTIFIC PRINCIPLES ON WHICH FACTS ARE BASED
Preparing breakfast.	1. For foods requiring long cooking the fireless cooker means economy of fuel. 2. On an electric stove boiling temperature may be secured more quickly in a pan, the bottom surface of which is flat; on a gas stove the pan should have a slightly rounded bottom surface.	Principles of heat, conduction, convection, and radiation.

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CHAPTER IV

PROBLEMS IN METHODS OF TEACHING

1. Summary

If "the curriculum" is the total range of experience through which the pupil passes in the process of formal education, then "methods of teaching" are whatever the teacher himself does to provide the experience. We shall accordingly continue to discuss the curriculum as comprising the things-to-be-learned-by-the-pupils or subject matter, which is capable of systematic statement or description in writing. Methods of teaching presuppose the existence of subject matter and consist of what-the-teacher-does in helping pupils to learn the subject matter. Hence subject matter is the written outline of activities or topics, or the text material itself. Methods of teaching are almost identical with methods of learning. Whatever the pupil does with the subject matter may represent methods of learning and if suggested or directed by the teacher they are also methods of teaching.

The convenience of this definition of teaching method will be more apparent as the chapter proceeds. Since the definition takes for granted the previous selection of appropriate subject matter, the investigation of

problems in method is greatly simplified. The assumption of appropriate subject matter in itself removes at least two of the difficulties upon which many studies in teaching method have come to grief. The first of these is the tendency to visit the sins of teaching method upon the curriculum, and vice versa, depending upon which of the two is being defended from attack. If the problem of supervised study in ninth-grade mathematics is being debated, it is not uncommon for an enthusiast to declare that the teaching procedure is beyond criticism and that the unsatisfactory results are due to the necessity of teaching the highly formalized materials prescribed. Where a committee is defending a course of study it has recently constructed, it is not uncommon to attribute the deficiencies in pupils' learning to the teachers' ineffective methods of presentation. Either, both, or neither may be right; there is no possibility of evaluating either subject matter or method as such until the two are clearly distinguished and evaluated separately.

A second difficulty removed by the definition is that which results from the tendency to identify methods of teaching with methods of learning for purposes of investigation. For other purposes it is legitimate to emphasize the effects of teaching method upon pupils' learning as the only safe criteria for the teaching methods used. It goes without saying that except in so far as a given teaching method produces more and better learning than some other method, it is open to

serious question. But there is a serious danger in carrying this principle too far.

Problems involving methods of individual learning are obviously less inclusive than problems involving methods of group teaching. Problems in individual learning therefore constitute excellent problems for research. Yet because problems of individual learning are so many steps removed from problems of classroom teaching, the latter type of problem must be investigated by the service study if the investigation seeks to select methods for direct application in the classroom.

Typical Service Problems. — Service problems in the field of teaching methods are reducible to four distinct types. As they appear in the master list of service problems (Chapter II), the four types are (a) selecting learning procedures, (b) constructing exercises and guide sheets, (c) motivating, and (d) testing. While there may be problems in teaching method that do not readily classify under these types, no such problem has been found that is capable of systematic investigation by service study techniques.

Various sub-problems for each of the types are shown in the master list of Chapter II. The sub-problems should be examined, since they help to define each type. If the implications of each type-problem are clearly understood, the reader will note that, taken together, the problems represent not merely the important factors involved in any adequate teaching procedure but also the types of problems that must be

considered successively in planning any procedure. Whenever the classroom conditions are such as to complicate one or more of the problems, it is desirable and usually necessary to investigate each problem separately.

The point of the foregoing paragraph may be clarified by considering each type of problem in the same teaching situation. Let us suppose that a teacher of ninth-grade English is planning the procedures he will use in teaching Scott's *Ivanhoe* and that the following desired outcomes have been specified: 1. The ability to write accurate character sketches of the persons described in the novel; 2. The ability to explain difficult passages and expressions by paraphrasing them; 3. The ability to discuss the author's meanings in terms of the pupil's own experience; 4. The ability to criticize Scott's style and structure on the basis of literary standards; 5. The ability to find in one of Scott's novels the passages that the given pupil finds thoroughly enjoyable.

In this situation the teacher must first decide which of various learning procedures are most likely to develop the abilities desired, as in the first type problem mentioned. It may be that this decision can be made off hand. The more homogeneous the class, the easier the decision is to make. Yet a typical class may contain two or three pupils who have read the novel before, two or three others who have never read any novel voluntarily and twenty pupils among whom the

abilities are very unequally distributed. Such a situation demands that the teacher determine by investigation the particular abilities that each pupil or group of pupils most needs to develop and also the classroom activities that are likely to develop such abilities most economically.

When the appropriate abilities and learning procedures have been tentatively selected for each pupil or pupil group, the need for investigation of the second service problem is likely to arise. That is to say, the teacher can often direct pupil's learning activities more efficiently when directions have been worked out in some form of exercise or guide sheet. The larger the number of different learning activities to be directed at the same time, the more essential it is that the exercises be set down on paper. In many cases, of course, such exercises may be oral, but it is none the less imperative that the teacher determine the most efficient methods for pupils to use in study and to make such methods explicit. This can seldom be done adequately without some investigation of the pupils' present methods of learning and some experiment with other methods as determined by classroom exercises.

The third type-problem of the chapter involves motivation; that is, the analysis of factors in the classroom situation that affect the pupils' attitude unfavorably and the modification of such factors as lie within the teacher's control. It may be that a distaste for *Ivanhoe* on the part of certain pupils is due to the

teacher's obtrusive emphasis of historical background, plot structure, and other elements irrelevant to the pupils' interest in the story. If so, the fact may be readily determined by service study techniques; and when determined, the teaching procedure may be modified in the direction of rapid reading for the story value until the class has become fond of the novel. Thereafter the class may be expected to find more interest in its historical and other implications. It would be hard to name any group of teaching problems more responsive to the service study approach than the problems of motivation. Motivation is a territory in which research is somewhat sterile and trial-and-error is costly.

The fourth type of problem involves the testing of results. It is customary to regard the technical problems of testing as the province of educational research *par excellence*, and such they doubtless are. There are many different sorts of problems involved in testing, however, and many of them are amenable to the service-study attack. Speaking generally, it may be maintained that research in the field of testing seeks to define learning products objectively and to standardize the methods of constructing valid and reliable tests of the products thus defined. Such an undertaking is enormously important for the progress of education as a science and highly significant results have already been achieved by research of this character.

On behalf of the service study it may be suggested,

however, that no learning product can be defined for *all* pupils except in very general terms. The outcomes from the study of *Ivanhoe*, for example, which can be objectively tested at the present time represent a very small part of the results that any competent teacher can accomplish with a *particular* class. One conclusion to be drawn is accordingly that for the next generation at least the less precise techniques of the service study must be used for what they are worth in revealing the extent to which a teacher succeeds in producing the important outcomes that cannot yet be objectively measured. One cannot tell how well a pupil likes *Ivanhoe* from what he states in reply to a test question. More conclusive evidence may be obtained from his general attitude in class, his remarks to his seatmates and parents, his attitude toward other novels by Scott, and his interest in class discussion.

Assumptions. — Since the service study of problems in teaching method becomes practicable only when appropriate subject matter is available, it is first necessary to assume that any prescribed subject matter is appropriate. This carries with it the further assumption that the objectives and desired outcomes of the given course or unit are specified, otherwise there are no criteria by which to make even a subjective evaluation of the teaching methods employed.

A second assumption must be made to exclude the problems of class management that otherwise obtrude in any investigation of teaching method. It is a fact

well-known to any experienced teacher that before pupils can learn efficiently it is necessary to establish order, reasonable quiet, freedom from distraction, and other conditions contributing to an atmosphere of interested and cooperative activity. Hence to define efficient methods of teaching, it is necessary to assume that methods of class management are available whereby the orderly classroom conditions necessary to the successful application of the teaching methods may be established and maintained.

A third assumption is that the teacher possesses the personal traits and professional skill required to use appropriate methods effectively. This assumption is difficult to test. Problems of personal adjustment to a given class of pupils lie beyond any techniques of investigation at present available. Such problems probably respond more readily to the service study than to research for the reason that the service study works at closer range.

Since the four problems represent factors that are involved in any teaching procedure, it is necessary either to study the four factors simultaneously when investigating a given problem or else to exclude the factors not studied by assuming them to be satisfactory. If the given problem, for example, consists in preparing exercise materials for a sixth-grade course in arithmetic, it is necessary to assume that the teacher has wisely chosen the general types of pupil-activity and methods of study to be directed by the exercises.

It must also be assumed that adequate motivation for working the exercises may be supplied and that methods of testing results are adequate to show to what extent the exercises accomplish the purpose intended.

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2. Selecting Learning Procedures

(Type Problem II A)

The type-problem of selecting learning procedures for a given course and class consists in finding out, for example, how a class in general science will learn certain facts about heat most readily. Pupils may learn the facts by performing laboratory experiments themselves, by reading about such experiments, by watching the teacher perform the experiments, by having the instructor tell them about the facts and their applications, by a combination of these methods, or by other methods not suggested. Too much pupil activity in the direction of classroom projects results in loss of time and in the learning of much that is irrelevant to the course. Too little pupil activity or too little variety in the pupils' learning activities results in loss of interest and consequent failure. The

finding of a happy compromise between too much and too little activity on the pupils' part and the wise selection of the activities to be assigned are matters commonly requiring investigation.

Problems. — This general type of problem includes specific problems of many forms. Just as subject matter may be selected in units of different size, so methods of learning the subject matter may be selected with different degrees of definiteness. For example, the problem of selecting effective learning procedures for a given class may require merely a decision for or against the plan of having pupils prepare most of their assignments in the classroom. Such a problem is general and indefinite. But the same problem may be reduced to much lower terms and require the investigation of methods whereby a given plan of supervised study may best be adapted to the needs of one or more pupils in difficulty. Between the very general and the very specific problems lie many others that are significant for most teachers.

The common element in all problems of this type is the necessity for locating the difficulties met by pupils in their attempts to develop the attitudes, abilities, or skills desired. When the difficulties are located, the investigation requires a collection of hopeful remedies and the selection, usually by experiment, of the particular remedies most helpful to the class as a whole.

Problems in selecting efficient learning methods represent many degrees of definiteness. This fact is

illustrated by investigations in reading. In his summary of investigations having to do with diagnosis and remedial instruction in reading[1], Gray reports difficulties resulting from a wide variety of causes. Such causes range in definiteness all the way from over-attention to oral reading, whereby an entire class becomes deficient in silent reading, to such specific defects in special cases as aphasia, deficient energy, and infantile stammer. Among the more frequent causes for unsatisfactory results in reading the following represent a degree of analysis not too detailed to be undertaken by service study techniques.[2]

1. Low general intelligence
2. Excessive training in oral reading
3. Too much phonics
4. Not enough phonics
5. Poor rate
6. Lack of ability to move the eye across the page rhythmically
7. Excessive lip movement
8. Deficiencies in power to organize
9. Lack of word knowledge
10. Insufficient experience

The remedial methods applied to remove the causes of difficulties in reading represent a similar range be-

[1] W. S. Gray — *Summary of Investigations Relating to Reading.* University of Chicago Press, 1925.

[2] Quoted from *Reading and Study*, G. A. Yoakam, p. 72, after W. S. Gray.

tween very general methods applicable to an entire class and very specific methods applied to individuals in laboratory experiments or experimental teaching. Hence the normal procedure to be followed by the service study in any subject is to try out such learning methods as may be applied by an entire class and retain those that give best results. For such pupils as fail to respond, the group methods may be further analyzed until specific methods are found for the individual cases. The procedures whereby such methods may be collected from available sources and selected with reference to the needs of the given class, come well within the scope of the service study.

Assumptions.—The assumptions generally implied in service studies of this type-problem are similar to those that apply to problems of teaching method in general, as outlined in the preceding section. That is to say, one must assume to begin with that the prescribed subject matter is appropriate, that methods of class management are successful in maintaining a classroom atmosphere conducive to study, and that the teacher's personality and teaching skill are adequate for effective application of the methods chosen.

In addition to these broad assumptions, more specific assumptions are suggested by the types of data desired but not obtained, by the productive sources not utilized, and by the appropriate techniques not applied. This means that for any given problem certain data will be desired which the investigator does not take the trouble

to obtain. In order to justify such omissions, it must be assumed that if the data were obtained, they would be consistent with other data that are obtained.

Suppose, for example, that the problem consists in selecting the methods by which a given class in civics may best learn the facts about the work of the local fire department. The investigator may wish to collect as many appropriate methods as he can and then select the most appropriate for experiment. The appropriate methods may be obtained from professional literature, from observation of other classes in civics, from interviews with teachers, from interviews with parents, from interviews with pupils, and from other sources. If the conditions of the problem are such as to suggest that the methods obtained from the literature alone are likely to include the methods obtainable from each of the other sources, the literature may be the only source consulted. In this case it would be necessary to assume that the data obtainable from each of the other sources would be consistent with the data obtained from the literature. If, however, the methods obtained from the literature prove to be inadequate, the other sources can readily be consulted.

The same principle applies to assumptions regarding techniques. Whatever techniques are selected as most efficient under the given conditions may prove less efficient than other techniques not utilized. Data obtained by interviews with other teachers, for example, may later be invalidated by data obtained by testing

the pupils of the given class. The assumptions needed to justify any selection of techniques for a given study are thus suggested by the techniques of the master list in Chapter II that are omitted in planning the particular study.

Type Procedure. — The specific methods by which to secure knowledge of principles, skills, points of view, and other learning products can seldom be selected to best advantage by any single method of investigation. The type procedure must accordingly be adapted to the given problem in the various ways illustrated by the specimen outlines.

The Problem. To determine the learning activities or study methods whereby a given class may learn the specified subject matter most readily, to define the difficulties met by pupils in performing such learning activities, and to collect efficient methods of helping pupils to overcome the difficulties.

Abstract of Procedure. 1. Taking the units or major divisions of the course in order, make a list of the important learning activities or study methods useful to the given class in learning each unit. (See Specimen Studies, No. 2, Step 1; No. 5, Step 1; No. 8, Step 1; No. 10, Sept 1.)

2. Classify the learning activities according to their objectives or desired outcomes and write each type of outcome at the top of a separate card. Then list on each card the particular learning or study activities that are considered most likely to enable the given

class to attain the particular outcome. (See Specimen Studies, No. 5, Step 2; No. 8, Step 2.)

3. From other experienced teachers, from books and articles on methods of teaching the given subject, and from the psychological studies cited as evidence by writers on methods of teaching, obtain any additional learning activities that are as promising as the activities already listed. (See Specimen Studies, No. 1, Steps 2, 3, 4; No. 3, Steps 2, 3; No. 4, Step 2; No. 10, Step 2.)

3a. (Optional.) Organize the learning activities by outlining a general plan of instruction for the given course. Consult recent books on general method at the appropriate grade level and adopt any suggestions likely to improve the general plan of instruction outlined. (See Specimen Studies, No. 2, Step 3; No. 7, Step 3; No. 10, Step 4.)

3b. (Optional.) Apply the general plan by preparing exercises and other classroom study assignments that involve the learning activities considered most appropriate to the particular subject matter covered. Whenever two or more types of learning activity are considered about equally appropriate, each should be included in the assignment. (See Specimen Study, No. 2, Step 5.)

3c. (Optional.) Submit the general plan of instruction as outlined, together with a few specimen assignments, to several expert teachers of the given subject and grade and ask each teacher to suggest improve-

ments. Revise both the general plan and the assignments in the light of any helpful suggestions received. (See Specimen Study, No. 7, Step 4.)

4. Submit the list of learning activities, classified according to their desired outcomes, to expert teachers and specialists. Ask each to indicate the learning activities considered most efficient in attaining the desired outcomes for the given type, class, and grade of pupils. Summarize the judgments. (See Specimen Studies, No. 4, Step 3; No. 7, Step 4; No. 10, Steps 2, 3.)

5. Prepare assignments which involve the learning activities selected as most efficient and record in some detail the specific difficulties met by individual pupils in performing the assignments. Examine the difficulties noted and select for further study those which prove most troublesome to a majority of the class. (See Specimen Studies, No. 1, Step 1; No. 2, Step 6; No. 3, Step 4; No. 4, Step 4; No. 5, Step 3; No. 6, Step 1; No. 7, Step 1; No. 8, Step 1; No. 9, Steps 1, 2; No. 10, Step 1.)

5a. (Optional.) Analyze each difficulty to determine its causes by consulting any literature that is applicable, by interviewing other teachers, and especially by close observation of individual pupils at work on the assignment. (See Specimen Studies, No. 1, Step 2; No. 5, Step 4; No. 7, Step 2; No. 8, Step 2; No. 9, Step 3.)

6. Collect suggestions from all available sources that

may serve to remove the causes for the serious difficulties noted. The difficulties are often overcome by other learning activities selected from the original list. (See Specimen Studies, No. 1, Step 3; No. 2, Step 6; No. 3, Step 4; No. 5, Step 5; No. 6, Step 3; No. 8, Step 3; No. 9, Step 4.)

7. Apply the suggestions considered most useful by making experimental changes in the general plan of instruction, in the individual assignments, or in the methods of helping individual pupils. Revise the teaching procedure according to the results observed. (See Specimen Studies, No. 1, Steps 4, 5; No. 2, Step 6; No. 3, Step 4; No. 4, Step 4; No. 5, Step 6; No. 6, Step 4; No. 7, Step 5; No. 8, Step 4; No. 9, Step 4.)

Type Study. — The following type study[1] covers only the first of the three related sub-problems mentioned in the statement of the type problem, namely, "to determine the learning activities or study methods whereby a given class may learn the specified subject matter most readily." The two remaining sub-problems are "to define the difficulties met by pupils in performing the learning activities," and "to collect efficient methods of helping pupils overcome the difficulties." It will be noted that the last two problems can be studied to advantage only in terms of a given

[1] Adapted by permission from H. E. Wilson " 'Things to do' in the Social Science Classroom," *Historical Outlook*, *XX* (1929), No. 5, pp. 218-224.

class of pupils and that the definition of difficulties and collection of solutions is relatively easy when once the learning activities are defined. The illustration accordingly is confined to the definition of learning activities.

Problem. To prepare a list of the activities useful to pupils in attaining the objectives of high school courses in the social studies, in order that the activities may be evaluated with reference to objectives of different types.

Assumptions. 1. That the objectives of the department and courses have been stated and analyzed into the specific outcomes of the class work.

2. That subject matter has been selected that is appropriate to the objectives.

3. That having prepared a sufficiently complete list of activities, the instructor may select the activities most useful in attaining any specified objective, may discover the difficulties met in performing the activities selected, and may utilize other learning activities as means of helping pupils to overcome the difficulties.

Procedure. (See the foregoing Abstract of Procedure for complete list of steps.)

Step 1

"List the important learning activities related to each unit."

The first step of the study consisted in going over the chapters of H. C. Hill's *Community Civics* and listing the things that pupils were assigned to do or might

be assigned to do as a means of comprehending each chapter clearly. Many activities were found in the "exercises" at the close of each chapter in this text.

Step 2

"Relate each activity to each specific objective which the activity should help pupils to attain."

It was found more satisfactory to classify the activities thus obtained first by type, and then with reference to the objectives of any given course. The type classification had the advantage of being applicable to any course whereas the classification by objectives applied only to courses having the same or similar objectives. Consequently, only the type classification is here shown as represented by the following headings:

1. Listening activities
2. Visual activities
3. Purely meditative activities
4. Oral activities
5. Writing activities
6. Drawing activities
7. Laboratory activities

Step 3

"Consult professional literature and other sources for additional learning activities."

Additions to the preliminary list of activities thus classified were obtained from the following sources: (1) thirty work-sheets used in various social science

courses in various high schools; (2) the suggestions and pedagogical aids contained in more than fifty textbooks; (3) representative manuals and courses of study; (4) the files of the *Historical Outlook* and scattered references in other periodicals; (5) the texts on methods of teaching the social sciences; and (6) specialists in the teaching of the social sciences who were asked to examine, criticize, and supplement the preliminary list of activities.

The complete list should be consulted in the files of the *Historical Outlook*, May, 1929, Vol. XX, No. 5, pp. 218-224. The first section of the list is shown below, not merely to illustrate the technique of preparing it but because the list is highly valuable to others in constructing similar lists in different subjects. The examples shown to illustrate each activity help to suggest the pupil activities most useful in attaining a specific objective in a given course.

A Tentative Master-List of Pupil-Activities in the Social Studies

A. Listening Activities

1. Listening during formal presentation of materials: e.g., "Today I want to take a few minutes to tell you about the unit we're going to study for the next two or three weeks. Give your undivided attention to what is said. Do not take notes or interrupt the presentation. You may ask questions after I have finished."

   (Presentation Assignment; University of Chicago

High School) "During John's floor-talk give him your undivided attention."

2. Listening during conversational class discussion: e.g., "Let's take a few minutes for discussion of this topic. If you will ask questions about matters which are not clear to you, make comments, and then *listen to the questions, answers, and comments of others in the class*, you may increase your own understanding of the topic."
3. Listening during personal interview or conference: e.g., "John, let's talk over this difficulty of yours. I'll tell you what I think about it and you tell me your attitude."
4. Listening to music: e.g., "We're going to play on the Victrola a record of a song that was popular among the soldiers of Washington's army. Listen carefully to it, and see if the song reveals to you the spirit and character of the Revolutionary troops who used it."

The remainder of the list contains 52 additional activities like the four above. The activities are classified under the following headings: Listening Activities, Visual Activities, Purely Meditative Activities, Oral Activities, Writing Activities, Drawing Activities, and Laboratory Activities (i.e., making surveys, collecting clippings, building models, conducting interviews, etc.).

Step 4

"Submit classified list of learning activities to a competent jury for rating."

As previously stated, the activities were classified by type rather than according to the objectives of any

one course; hence they could not be evaluated by experts. This step is covered by Assumption 3.

Step 5

"Assign the activities to the class and record specific difficulties."

The examples supplied for each activity suggest the nature of assignments based on each. In the study here reported the difficulties met by the given class were not recorded. The method of recording such difficulties by observation of a given class is probably too obvious to require illustration.

Steps 6 and 7

"Collect solutions for the difficulties from all available sources and apply them experimentally."

While in a service study these steps are needed to justify each of the steps preceding, neither one was taken in the study here reported. Explanations of Step 6 will be found in the discussion of "analysis," Chapter VI, pp. 487 ff; and of Step 7 in the discussion of "experiment," Chapter VI, pp. 639 ff.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

[1] The twelve types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

SOURCES	TECHNIQUES										
	Analysis	Observation	Personal Interview	Group Conference	Question Blank	Check List	Experiment	Testing	Group Rating	Individual Evaluation	Classification
Pupils in the class	.....	**3, 6**	**3, 4, 6**	.....	3, 4, 6	3, 4, 6	**11**	**3, 6**	....	....	**2**
Teachers	.....	....	**1, 3, 4, 5, 7**	**1, 4, 5, 7**	5, 7	1, **3**, 5	....	....	**8, 9**	....	....
Supervisors	.....	....	**1, 3, 4, 5, 7**	....	.....	.....	....	....	....	**8, 9**	....
Other authorities on teaching	.....	....	.....	.....	1, 3, 4, **5, 7**	**1, 3, 4,** 5	....	....	**8, 9**	....	....
Subject matter experts	.....	....	.....	.....	1, 3	1, 3	....	....	....	....	....
Professional literature on special methods	**1, 3, 4, 5, 7**	....	.....	.....	.....	.....	....	....	....	....	....
on general methods	**1**, 3, 4, **5, 7**	....	.....	.....	.....	.....	....	....	....	....	....
on psychology of learning	**1, 3, 4**	....	.....	.....	.....	.....	....	....	....	....	....
texts and courses of study	**1**	....	.....	.....	.....	.....	....	....	....	....	....
research studies on learning	**1, 3, 4, 5**	....	.....	.....	.....	.....	....	....	....	....	....
Written work of pupils	3	....	.....	.....	.....	.....	....	....	....	....	....

Boldface figures indicate essential steps; others are optional.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES						
	Analysis	Individual Evaluation	Comparison	Summarizing	Classification	Organizing	Frequency Count
Units and topics of the course	**1**	....	....	....	....	**10**	....
List of learning procedures desired	**7**	**9**	**7**	....	**2**	**10**	....
Pupil difficulties in learning	**4**	**8**	**5**	....	**2**	**10**	**8**
Methods of work and study employed by pupils	....	**9**	**5**	....	**2**	....	....
Causes of pupil difficulties	**5**	....	**5**	....	....	....	....
Devices of overcoming pupil difficulties	**7**	**9**	**7**	....	**2**	**10**	....
Teacher activities involved in pupil learning activities	....	**9**	....	....	**2**	**10**	....
Criticism of plan of instruction	....	**11**	....	**11**	....	....	....

Boldface figures indicate essential steps; others are optional.

1. Learning procedures desired in the course.
2. General types of learning procedures, pupil difficulties, or teaching procedures.
3. Pupil difficulties in learning related to the course.
4. Causes of pupil difficulties in learning.
5. Devices useful in overcoming pupil difficulties in learning.
6. Methods of study and work followed by pupils.
7. Teacher activities involved in pupil learning activities.
8. Most important types of difficulties, procedures and devices.
9. List of best learning and teaching procedures.
10. Plan of instructor for the course.
11. Suggestions for improving plan of instruction.
12. Valid and reliable results.

Specimen Service Studies. — Teachers are probably more concerned with the selection of appropriate methods of learning than with any other type problem discussed in this text. The service study has greater value to teachers than most research upon this problem, for the reason that the service study may be restricted to a particular class wherein the responses of the pupils actually concerned may be used as criteria in selecting the methods of learning. Since the nature of the problem depends upon the subject matter to be taught and upon the characteristics of the given class, it is impossible to present specimen studies that ade-

quately represent all varieties of problems without exceeding reasonable limitations of space. Thus the reader will occasionally find it necessary to supplement the procedures outlined in this section by other procedures obtained from the master lists of Chapter II.

Reading — Elementary Grades

Problem No. 1: To select methods of helping a slow section of the sixth grade to form correct interpretations of the materials prescribed for reading — e.g., stories from American History.

Major Assumptions: 1. That a desired outcome of the course is the ability to identify the situations described in the prescribed reading with situations either within the pupil's experience or within his powers of comprehension.

2. That the given class tends to read words without gaining clear meanings.

3. That the prescribed reading materials are appropriate for the given class.

4. That the methods of reading employed by the given pupils are unsatisfactory.

5. That the pupils are capable of forming correct appreciations and clear meanings if proper reading methods are employed.

Procedure: 1. Give the class a standardized silent reading test and determine the distribution of scores for comprehension with reference to grade standards, i.e., determine the sixth grade pupils whose compre-

hension is normal for the seventh grade, sixth grade, fifth grade, or other grades.

2. Observe the pupils at work who represent different levels of ability in comprehension. Watch each of the selected pupils as he reads; then write down an accurate description of his behavior. Then ask the pupil questions about the reading and record his replies, noting the specific difficulties in interpreting meanings.

3. Consult the literature on reading and methods of teaching reading and make a list of the methods that are likely to obviate the difficulties in interpreting meanings, together with devices useful in training pupils to use such methods.

4. Select the reading methods considered most useful to the given class and plan the procedure to be used in teaching them. Submit the methods and teaching procedure to other experienced teachers of reading for criticism.

5. Apply the procedure and revise it as suggested by the results attained on another form of the same standard test in silent reading.

Comment on Findings: 1. Of the methods useful in teaching correct interpretation, dramatizing proved to be the most helpful since the pupil had a clearer notion of the purpose of his reading.

2. By first telling such a story as the Courtship of Miles Standish and then arranging for certain pupils to act it, the interpretation of the story was directed

by the effort to find details that were omitted in the acting.

Reading — Elementary Grades

Problem No. 2: To determine methods of reading which pupils may more readily apply in their study of other content subjects in the fifth grade.

Major Assumptions: 1. That instruction in the reading class is largely confined to problems met in reading narrative material and to the mechanics of reading — i.e., word study, paraphrasing, et al.

2. That the pupils are deficient in their ability to obtain clear ideas from reading materials in history, geography, nature study, and other content subjects.

3. That instruction in reading should be related as closely as possible to pupils' reading in other school subjects.

Procedure: 1. List the purposes for which fifth grade pupils have occasion to read in any school subject and elsewhere. Make the list as complete as possible by checking it against the course of study for the grade and against the typical learning activities indicated by assignments or less on plans.

2. Submit the list to other teachers for additions and corrections.

3. Examine the literature on the teaching of reading in elementary grades and add any appropriate purposes not already listed.

4. Submit the revised list to other fifth grade teachers, asking each to rate the purposes according

to their importance for fifth grade pupils in each subject, then in all subjects.

5. Select for special emphasis such of the reading materials prescribed for the grade as are best read for the purposes rated as most important.

6. Assign the materials in whatever manner is most likely to encourage pupils to read for the purposes specified, taking each type of purpose separately. Note the difficulties met in accomplishing the given purpose, and experiment with more specific methods, to remove each type of difficulty, as suggested by professional literature.

Comment on Findings: 1. The purposes previously emphasized in the reading class were found to be relatively unimportant to the pupil in reading content subjects — for example, to enlarge vocabulary, to increase rate of reading, to find or verify spellings, to find specific meanings, to reproduce what has been read, to master sentence structure, et al.

2. The purposes found to be more important were substituted, for example; to determine the main outline of a story or article, to organize the principal parts and supporting details of a textbook assignment, to gather information by extensive reading, to find illustrations, to answer problems or questions, to find directions, recipes, rules, etc.

References: W. S. Gray, *Summary of Investigations Relating to Reading*, University of Chicago Press, 1925; G. A. Yoakam, *Reading and Study*, Macmillan, 1927.

English Composition — Elementary Grades

Problem No. 3: To select learning methods effective in overcoming persistent errors in the writing of sixth grade pupils.

Major Assumptions: 1. That the persistent errors have been identified by analysis of pupils' written work in all subjects studied.

2. That the pupils' failure to overcome the errors may be ascribed in large part to faulty methods of learning.

Procedure: 1. Construct a test based upon the list of errors made by the pupils of the given class. Apply the test to determine the relative importance of the errors as indicated by the number of pupils who fail to correct each error.

2. Interview other teachers of intermediate grades to collect methods of helping pupils to correct each error in turn. For example, ask such questions as the following and record the replies to each: a. "Think of a pupil who has great difficulty in outlining material before writing it. What causes his difficulty and what methods do you use to overcome it? b. Think of a pupil who is unusually good at organizing written work. How does he go to work? Please give as many specific examples as you can."

3. Summarize the suggestions contained in the replies and consult professional literature for further suggestions.

4. Apply first the suggestions pertinent to the most general difficulty by selecting such learning procedures

as are capable of being effectively combined. Test the class again to check the effectiveness of the methods and apply further suggestions until successful methods are found.

Comment on Findings: 1. The difficulty of making outlines and the resulting errors in organization of material were found most serious for the given class.

2. Such learning methods as the following were collected and successfully applied: (a) Let the pupils take a familiar story and outline the characters in it by first listing the characters in order of importance and then listing the important characteristics of each. (b) Tell the class a story, have several pupils reproduce it orally, then have all write an outline. The teacher places a correct outline on the board and comparisons are made to indicate errors in pupils' judgment. (c) Teach pupils to apply the following questions to their own outlines: Do topics stick together? Is each topic important? Can the order of the topics be improved? (d) Take particular pains to prevent pupils from thinking of outlining as an end in itself and show each pupil the value of an outline in improving his work. (e) Teach the making of simple outlines in connection with all subjects that involve any organization of material.

French — Secondary Grades

Problem No. 4: To select effective methods for learning grammatical rules in first year French.

Major Assumptions: 1. That the mastery of certain rules is required by the objectives of the prescribed course.

2. That the methods employed by the given class in learning the rules are unsatisfactory and that satisfactory methods are available.

Procedure: 1. Outline in some detail the methods used by representative pupils in learning rules. From such outlines prepare a description of the typical methods employed. Include in the description a clear account of the teacher's activities involved.

2. Examine books and articles on special methods of teaching French, teachers' manuals issued by writers of French grammars, and the suggestions for teaching contained in the textbooks used. From these sources list such methods of learning grammatical rules as are considered at all appropriate for the given class and such as have not previously been used.

3. Submit the description of the typical methods in use, together with the summary list of other methods, to several experienced teachers of first year French. Request each teacher to indicate inefficiencies in the former methods and to indicate the methods that should be adopted from the summary list.

4. Revise the learning procedure in the light of the criticisms received and apply it to the class experimentally. Revise further on the basis of results observed.

Comment on Findings: 1. Various methods were

obtained from the sources mentioned. Each method was analyzed into considerable detail. The following methods are typical but the analysis is not shown: study in supervised period, oral recitation and criticism by teacher, oral and written tests at frequent intervals preceded by systematic oral and written drills, repeated application — examples in French by teacher, then by pupil; comparison and contrast with English rules, repetition of rules with illustrations by pupils; compare French with use of English rules; inductive lessons, e.g., several examples are placed upon the board illustrating a certain principle, the rule is then formulated; a rule is explained and illustrated fully in one period — in the next period sentences are given for application, blackboard drill, i.e., pupils are to apply rule to simple sentences at the board — first in composing sentences, then in correcting them; learn rules inductively — e.g., pointing out the direct object of a sentence in English, then throwing it into the French form, then translating into French.

2. Substitution of the methods collected helped considerably to improve the intelligent learning of rules. The inductive methods were worked out in detail for and with the pupils having difficulties with particular rules.

American History — Elementary Grades

Problem No. 5: To determine methods whereby sixth grade pupils may most readily acquire tolerant

attitudes toward groups and institutions against which they are prejudiced.

Major Assumptions: 1. That a tolerant attitude toward "inferior" social groups is an important objective in the teaching of American History in the sixth grade.

2. That intolerance is remedied by correct information concerning the social groups believed to be inferior and by greater familiarity with such groups.

3. That irrational prejudices of a social kind may be detected in individual pupils by various expressions, gestures, and statements during school hours.

Procedure: 1. Collect various conditions in the given class or school that tend to create or to intensify prejudices on the part of certain pupils against other social groups regarded as inferior; such as; farmer's children in suburban or large town schools, city children in town schools, foreign children in school, negro and other racial groups in the school or community, and children of coal miners and other union labor groups in school.

2. In connection with each such condition, record as many specific indications of intolerance and prejudice as can be obtained by classroom observation, by interviews with other teachers, parents, and selected pupils, and by reading literature issued by social organizations such as the Ku Klux Klan, National Security League, American Peace Society, et al.

3. Prepare test forms of the multiple choice type,

based upon the prejudices found to exist in the given group. Apply such tests and other problem situations to determine the pupils who are least capable of seeing both sides of the controversial issues in the given community.

4. Select the historical materials that may be used to explain controversial issues by tracing them back to the conditions from which the issue developed. Collect additional reading, preferably in story form, which presents both sides of the issue or which wins sympathy for the unpopular side.

5. Obtain suggestions from professional literature and other teachers regarding classroom study and project methods that are most appropriate in using such reading materials to remove prejudices of the types indicated; such as, having each pupil collect all the evidence he can for both sides of the question, having the class discuss two conflicting claims until it is clear that each claim is probably only half true, et al.

6. Select the methods most appropriate for the class by experimenting with the more promising suggestions received.

Comment on Findings: 1. The important controversial issues regarding which a majority of the pupils showed strong prejudices were classified under six main headings and included about twenty-five specific issues. It was found easily possible to give adequate attention to each during the time allowed for history without interfering with other work.

2. The attempt "to see both sides of the question" added much interest to the other work in history.

3. Several methods were found which presented the issues impartially and which produced highly satisfactory results by the end of the year.

Civics — Secondary Grades

Problem No. 6: To select study methods useful in overcoming pupils' difficulties in ninth-grade civics.

Major Assumptions: 1. That serious obstacles to the attainment of objectives specified for the course are due to the pupils' methods of study.

2. That such obstacles may be identified and defined by teachers and pupils of the given course and similar courses on the junior high-school level.

3. That practicable suggestions toward overcoming the obstacles may be obtained from professional literature and from teachers of the subject.

Procedure: 1. Prepare a list of difficulties met by junior high-school pupils in learning social-science subjects. The difficulties may be obtained from personal experience, from professional literature, from other teachers, and especially from pupils — by personal interview. When interviewing pupils, prepare two or three questions in advance that will oblige the pupil to give specific examples of the difficulties he has met in learning the subject matter. Select two pupils of about equal ability in the subject and encourage them to talk freely about their difficulties by asking one to

comment on what the other pupil says. Record all remarks as accurately as possible.

2. Classify the difficulties obtained from each source in the form of a master list. Determine the relative importance of the difficulties for the given class by means of tests, whenever tests may be constructed to show the existence of the difficulty. Estimate the seriousness of the other difficulties by considering each pupil with respect to the difficulties listed.

3. Select the difficulties of most importance for special treatment. Collect learning methods to overcome the difficulties selected — by consulting other teachers, corresponding with experts in the teaching of social studies, and examining literature on methods of teaching junior high-school civics.

4. Introduce the more promising methods and revise them on the basis of the effects observed.

Comment on Findings: 1. Ninety-five specific difficulties were collected from the various sources indicated.

2. The three difficulties estimated to be most serious for the given class were (a) reading difficulties — e.g., inability to get clear meanings from the words and sentences read; (b) difficulties in relating situations discussed in the text to situations met in real life or in other subjects; and (c) difficulties due to deficiencies in experience with civic institutions and civic activities.

3. Methods of overcoming the difficulties were obained in considerable detail — e.g., meanings were

clarified by the frequent use of best-answer exercises; textbook situations were related to life situations by class excursions and group projects; deficiencies in experience were supplied by outside speakers, individual reports, and by an abundance of simple, collateral reading.

Reference: Waples, D., *Problems in Classroom Method*, Appendix H., Macmillan, 1927.

Elementary Algebra

Problem No. 7: To determine difficulties met in the interpretation and use of algebraic formulas and to select methods effective in removing the difficulties.

Major Assumptions: 1. That difficulties in the use of formulas commonly result from failure to understand their derivation and purpose.

2. That the correct understanding of a given formula depends largely upon the nature of the first explanation.

Procedure: 1. Prepare a series of tests upon the application of the significant formulas contained in the prescribed course, the tests consisting of problems to be solved by different formulas.

2. Analyze the results to discover the misconceptions regarding each formula as implied by the wrong applications made of it.

3. Prepare a series of illustrative examples useful in explaining what is needed to clear away such misconceptions. Prepare also a brief talk to accompany the example, as "first exposures" obtained from per-

sonal experience, professional literature, and other teachers of algebra.

4. Submit written descriptions of the methods to other teachers, asking each teacher to indicate the features considered most helpful and least helpful in removing pupils' difficulties with the interpretation of formulas.

5. Apply each type of "first exposure" to a different class, testing the classes before and after the explanations. Retain the type of explanation which produces the largest improvement in the test scores.

Comment on Findings: 1. Four distinct types of "first exposure" to typical formulas were prepared on the basis of suggestions obtained from the literature. Of these one proved clearly superior.

2. The tests were no more helpful in selecting the best procedure than the independent judgment of the investigator after each method of explanation had been developed in detail.

References: National Council of Teachers of Mathematics, *First, Second,* and *Third Yearbooks*; G. T. Buswell, *Summary of Investigations in Arithmetic.*

General Science — Secondary Grades

Problem No. 8: To select learning activities appropriate both to the desired outcomes and to the materials prescribed for each unit of a ninth-grade course in general science.

Major Assumptions: 1. That the desired outcomes

and prescribed materials are wisely chosen from the standpoint of the pupils' needs.

2. That any learning activities are appropriate which serve to remove pupils' difficulties in attaining the desired outcomes by means of the prescribed materials.

Procedure: 1. Select for investigation the first unit of the course or the most difficult of the units already studied by the given class. Examine the different requirements of the unit, as indicated by the materials and the desired outcomes of the course and unit, and list the difficulties encountered by one or more pupils in meeting the requirements. Supplement the list by additional difficulties obtained from such sources as the following: (a) errors in pupils' exercises; (b) individual pupils' requests for help; (c) wrong responses on tests; (d) conferences to discuss and explain errors or points of confusion; (e) observation and questioning of individual pupils engaged in study; (f) significant responses of class to teacher's presentations of new material and group explanations; (g) list of difficulties in science, prepared by others, to be applied as checklists to the given class.

2. Classify the difficulties obtained from each source with reference to the type of activity involved, whether the activity be psychological or merely physical.

3. Study the difficulties of each group, taking the groups one at a time. With the aid of teachers' manuals and other experienced teachers of general science, set down whatever suggestions regarding

methods of study are most likely to remove the specific difficulties of the given group.

4. Combine the suggestions noted for the given group of difficulties into a learning procedure applicable by the class as a whole to the given unit. Do the same for other units. Present to the pupils for classroom use and revise wherever the occurrence of new difficulties makes revision advisable.

Comment on Findings: 1. The study served to improve the methods formerly used by removing difficulties such as the pupils' unfamiliarity with the terms used in the teacher's explanations, inability to see the relationship between different science principles studied separately, et al.

2. The most important source of difficulties was the teacher's record of individual pupils' requests for help.

3. The new learning methods differed from the old chiefly in that the teacher gave *in the first presentation of the unit* the explanations and suggestions concerning methods of study that had formerly been given incidentally to individual pupils, who asked for help.

Domestic Science — Secondary Grades

Problem No. 9: To define efficient learning methods for a ninth-grade class in "Dress Design and Construction."

Major Assumptions: 1. That learning methods are efficient when they serve to overcome the difficulties

met by the pupils of the class in constructing satisfactory dresses.

2. That significant difficulties are suggested by the faults in the garments constructed and by the pupils' own reports concerning their difficulties.

Procedure: 1. Compile a list of typical difficulties confronting the given class by interviewing other teachers of home economics, by interviewing pupils, and by submitting samples of the girls' work to practical seamstresses and dressmakers who are asked to indicate faults. Present the difficulties observed from day to day in the form of a check list to other teachers, asking each to add others they have noted. Present the list also to the mothers of any girls who feel their mothers would be interested.

2. Classify the faults under the difficulties causing the faults, for example:

Faults	*Difficulty*
Structural lines out of proportion	Failure to appreciate and apply the appropriate principles of design and color.
Lack of color harmony	
Decorative lines over-emphasized.	

3. Analyze the difficulties by observing the class at work, by observing other teachers, by the aid of literature on the teaching of sewing, on dress construction, and on related subjects; and by means of diagnostic tests (e.g., Stevenson — Comprehension of Patterns, Murdock—Hand-Sewing).

4. Collect from all available sources any methods of overcoming the causes of the difficulties as analyzed, especially from the literature and from experienced dressmakers. Organize the methods in teaching form and present to the class, revising where necessary.

Comment on Findings: 1. The difficulties were analyzed into some seven causes which previous instruction had failed to remove.

2. Efficient methods of overcoming the difficulties were readily obtained from commercial dressmakers.

Reference: Bowman, *Problems in Home Economics Teaching*, University of Chicago Press.

Industrial Arts — Secondary Grades

Problem No. 10: To select and organize specific learning activities in their relation to the prescribed units of a course in machine shop work.

Major Assumptions: 1. That the objectives of the course emphasize an intelligent attitude toward the machine and require no attention to the development of vocational skills as such.

2. That the pupils' learning activities may be evaluated with reference both to the mechanical principles and to the vocational applications of the machine processes studied.

Procedure: 1. Obtain a comprehensive list of pupil activities by systematic and recorded observations of the pupils at work in the course, including both classroom and laboratory activities.

2. Submit the list to other teachers of industrial arts, asking each teacher to check the more important activities and to add others equally important from the standpoint of the objectives stated.

3. Submit the list to machine-shop foremen, engineers, or others familiar both with the mechanical principles and with the industrial applications of the machines studied. Ask each to check the learning activities considered most important to an intelligent acquaintance with the machine and to suggest other activities for the classroom or shop considered equally important.

4. Combine the suggestions received and organize the plan of instruction for each unit accordingly.

Comment on Findings: 1. The teachers added several important reading projects and shop projects to the list representing what pupils had done previously.

2. The professional mechanics eliminated various activities as non-essential to an understanding of the machines and suggested other activities (for the shop) that proved to be highly effective.

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3. Constructing Exercises and Direction Sheets

(Type Problem II B)

It is possible to regard a written exercise or a direction sheet either as an item of subject matter or as a method of instruction. Classroom exercises have certainly all the important characteristics of subject matter for the teachers and the pupils who use them, yet they also constitute methods of teaching the principles or units with which the exercise deals. The oral or written exercise is thus a concrete method of learning. The construction of exercises and guide sheets is an essential next step when an efficient method of learning has been selected for any given type of subject matter.

Having determined or assumed the validity of the

subject matter to be taught, the investigator has mainly to determine what the pupils should do with the subject matter in order to learn it. He has then to prepare an exercise or a direction sheet that will guide the pupil in doing these things. More definitely, the investigator must determine the types of exercise available and then apply the most appropriate type to the subject matter at hand.

Problems. — The problem of constructing exercises and direction sheets represents various degrees of scope. Problems may be distinguished by differences in scope somewhat as follows: (a) to construct a direction sheet for the course as a whole; (b) to construct a direction sheet or exercise for a given unit of the course; (c) to construct a direction sheet or exercise for a single problem or principle; (d) to construct an exercise for a specific skill or item of subject matter to be mastered.

The Exercise. — The distinction between an exercise and a direction sheet requires some definition of both. In brief, an exercise may be said to present certain items of subject matter so analyzed and presented that the pupil may learn them readily. The direction sheet emphasizes certain methods of study as applied to the given materials. An exercise is organized so as to help the pupil work his way through a given problem and arrive at a desired conclusion. While never entirely distinct, most learning exercises imply either one or both of two purposes; namely, to

help the pupils solve a problem by reflective thinking or to provide the sort of practice necessary in acquiring a given skill. Exercises of the latter type are more frequently used and are common in such formal subjects as arithmetic, grammar, physical training, foreign language, algebra, geometry, practical arts, and other laboratory courses. Exercises to direct pupils' reflective thinking are less common but no less necessary in the teaching of content subjects, regardless of grade. Since the primary function of the written exercise is to supply to an entire class simultaneously the sort of direction that must otherwise be given orally to individual pupils, its economy should be obvious.

Drill exercises of various types are familiar to any teacher from the examples contained in school textbooks. The various forms in which published tests appear are useful both for reflective thinking and for drill exercises when the form is selected with reference to the subject matter and applied to the specific learning difficulties of the given class. The following example illustrates what is an essential characteristic of an exercise used to direct pupils' thinking; namely, the sequence of steps leading to a desired conclusion upon which each member of the class may work at his own best rate of speed and with what ability he has developed.[1]

[1] Quoted from Douglas Waples, "The Best-Answer Exercise as a Teaching Device," *Journal of Educational Research*, January 1927; by courtesy of the Public School Publishing Co. Also found in *Problems in Classroom Method*, Appendix E, Macmillan, 1927.

Given:
$ABCD$ is a trapezoid
$AM = MB$
$MP \parallel AD$

A. Which of the following can you prove?
   1. $MP \parallel BC$.
   2. $CP = PD$.
   3. $MP = \frac{1}{2}(AD + BC)$.
   4. $\angle MRB = \angle BDA$.

B. Which of the following will help you prove your choice in A?
   1. $MP \parallel AD$.
   2. $BC \parallel AD$.
   3. $BR = RD$.
   4. $MR = \frac{1}{2}AD$; $RP = \frac{1}{2}BC$.

C. Which of the following axioms, theorems, and corollaries would you use to prove your choice in A?
   1. If a straight line is parallel to one side of a triangle and bisects another side, it bisects the third side.
   2. If equals are added to equals the sums are equal.
   3. If a straight line is parallel to one of two parallels, it is parallel to the other also.
   4. If two parallel straight lines are cut by a transversal, the corresponding angles are equal.

D. Which of the following axioms, theorems, and corollaries would you use to prove your choice in B?
   1. The line joining the midpoints of two sides of a triangle is parallel to the third side and equal to one-half of it.
   2. If a straight line is parallel to one side of a triangle and bisects another side, it bisects the third side also.
   3. If a straight line is parallel to one of two parallels it is parallel to the other also.

4. A trapezoid is a quadrilateral with two sides parallel.

E. Fill the blank parentheses below with the numbers of the corresponding items checked in B, C, and D just given:

(A) (1) (B) ( ) (C) ( ) (D) ( )
(A) (2) (B) ( ) (C) ( ) (D) ( )
(A) (3) (B) ( ) (C) ( ) (D) ( )
(A) (4) (B) ( ) (C) ( ) (D) ( )[1]

The table on page 272 presents an analysis of this particular type of exercise as applied to various secondary school subjects.

The Direction Sheet. — The direction sheet may be defined as a written assignment. The assignment may cover an entire course or any part of the course. The assignment, moreover, should indicate not merely what the pupil is to do but how he is to do it. In this sense the direction sheet includes the exercise as above described. Essentially the method of constructing either the direction sheet or the exercise consists in recording the explanations and other advice which a majority of pupils require in order to deal intelligently with the given unit of subject matter. The recorded advice is then developed experimentally so that it may be presented in writing with the utmost clearness to the pupils.

The following introduction to a direction sheet indi-

[1] By courtesy of D. F. Brightbill, Belleview High School, Belleview, Pa., by whom this exercise was developed.

ELEMENTS OF THE BEST-ANSWER EXERCISE IN DIFFERENT SUBJECTS

SUBJECT	PROBLEM SITUATION	ANALYSIS	SELECTION OR INTERPRETATION	GENERALIZATION OR PROOF
(1)	(2)	(3)	(4)	(5)
English literature	A broad, significant, question requiring understanding and application of text.	A list of possible interpretations of the text or selected passages.	Directions to check plausible interpretations from list.	Directions to cite specific references which justify the interpretations checked.
Social science	The description of a complex social situation involving a given principle or policy.	A list of the social implications of the situation.	Directions to check the implications that are most important or most pertinent to the given principle.	Directions to test this selection by readings or to outline means of improving the situation.
Science	The description of an experiment involving a given scientific principle.	A list of possible explanations for the results of the experiment described.	Directions to check the explanations that are scientifically valid.	Directions to cite scientific principles which support the explanations checked.
Language	A list of expressions involving the same rule of grammar, syntax, or rhetoric.	Directions to state a rule to explain the similarity of these expressions.	A list of other expressions, some involving the rule and others not. Pupils check those involving the rule.	Directions to test adequacy of rules derived by comparison with rule found in text.
Mathematics	An algebraic or geometrical problem to be solved.	A list of the elements of the given problem.	Directions to organize these elements according to some formula or plan.	Directions to solve the problem or prove the conclusion.
Home economics	The description of a situation in home management which is unsatisfactory.	A list of both desirable and undesirable conditions in this situation.	Directions to check the undesirable conditions.	Directions to state or check remedies for the conditions checked by applying certain rules.
Shop	The description of a problem requiring use of machine tools.	A list of operations required to do the job.	Directions to check the correct methods of performing these operations from a list of methods.	Directions to justify the methods selected by reference to trade or scientific principles.

cates the value of such materials in directing written work upon a single unit:

SURVEY OF CIVILIZATION
Unit IV. The Ancient Romans

This direction sheet embodies a set of exercises dealing with the unit on the Ancient Romans, "Consolidators of the World." The exercises have been selected carefully, and each one should help you understand more clearly the significant ideas involved in the unit.

As soon as the direction sheet is handed you, begin work on the exercises listed in it, completing them *in the order in which they are listed.* Work as rapidly as you are able but do not sacrifice accuracy for speed. Work independently, but ask the instructor for direction whenever necessary. Hand in the written material on each exercise as soon as it is completed.

Bear in mind that all written work will be read by the instructor with two purposes in mind, (1) to evaluate the accuracy and completeness of its historical content, and (2) to check on your usage of English. Do your best in respect to both content and usage at all times. Always put at the top of your paper, (1) your name, (2) the number and title of the exercise, and (3) the date on which the exercise is handed in. Leave a margin on all four sides of the paper; write legibly. Proofread your paper before it is handed in, and, as a sign that you have done so, write at the end of the paper the word "Proofread" with the date and your own initials.

Assumptions. — 1. It must be assumed that the subject matter to be learned has been well selected

[1] By courtesy of Howard E. Wilson, Graduate School of Education, Harvard University.

with reference to the desired outcomes of the course and to the needs of the given class. This assumption is basic since the subject matter necessarily determines the exercise materials and the latter are of little value unless the subject matter is intrinsically important. The direction sheet is less dependent upon the subject matter since purely traditional subject matter may be enriched and vitalized by a direction sheet that applies it to new purposes and suggests important implications that pupils might otherwise miss.

2. It must also be assumed that efficient methods of learning the prescribed materials have been selected for the given class, since the exercise and direction sheets are intended to help pupils to apply such methods.

3. A third assumption is that forms are available or may be developed which actually simplify the use of the learning methods selected. This assumption will naturally be tested in attempting to construct the exercise materials. Yet the assumption needs to be stated if merely to emphasize the fact that not all methods of learning may be directed by written materials. Written exercises in the appreciation of English poetry for example, sometimes defeat their purpose.

4. A fourth assumption is that the teacher by whom an exercise is used in the classroom is competent to modify it as the needs of individual pupils require. To regard any teaching instrument as so perfect that it may safely be used as an end in itself would, of course, do serious harm. Few exercises can be so

standardized that they can be applied to several classes without important changes.

5. Another assumption must be added because of its practical importance; namely, that multigraphing facilities are available. The value of an exercise or direction sheet to the class depends largely upon each pupil's having his own copy. Unless the sheets are multigraphed, the difficulties in working the exercises, in correcting them, and in filing the sheets for future reference may well be so serious as to make the use of exercises unwise.

Type Procedure. — The construction of exercises to direct pupils' reflective thinking is ordinarily more difficult than the construction of drill exercises. The construction of direction sheets presents no serious difficulties except where the range of ability is so great within a given class as to make any one set of directions inappropriate for certain pupils. For these reasons the procedure outlined below is primarily concerned with exercises for the direction of reflective thinking.

The Problem. To prepare exercises or direction sheets for use in a given class by analyzing the items of subject matter and learning methods that need to be explained in detail to a significant number of pupils.[1]

Abstract of Procedure. 1. Construct and apply diagnostic tests based on the desired outcomes of a

[1] For a more detailed discussion of learning exercises see W. S. Monroe, *Directed Learning in the High School*, and D. Waples, *Problems in Classroom Method*, Appendix E.

particular course or unit in order to determine the nature and distribution of specific difficulties or deficiencies within the class that either require preparation of materials in exercise form or that require emphasis of certain methods of work by means of direction sheets. (See Specimen Studies, No. 3, Step 1; No. 7, Step 1; No. 12, Step 1.)

2. Select as the objective for each type of written exercise or direction sheet one such deficiency that can be removed by reflective thinking on significant elements, by concentrated study of small and related problems, by practice upon specific skills, or by other specific learning activities that may be directed by exercises or guide sheets. (See Specimen Studies, No. 2, Step 1; No. 4, Step 1; No. 5, Step 1; No. 7, Step 3; No. 12, Step 2.)

2a. (Optional.) Analyze the selected objective into elements sufficiently small so that each element can be clearly understood by the pupils concerned. Such an analysis usually requires further testing upon the single type of work with which the exercise deals. Appropriate tests should be applied to determine the important facts of which pupils are ignorant, significant errors in perspective, significant relationships among principles or between principles and applications which pupils have not grasped, minor skills needing practice, terms not clearly understood, personal traits needing development, and other specific obstacles to the attainment of the single objective chosen. Where the nature

of such obstacles prevents their being determined by group tests, they may be determined by interview with pupils or teachers, by correspondence with specialists in the particular field, or occasionally by selection from professional literature. (See Specimen Studies, No. 2, Step 2; No. 4, Step 1; No. 5, Step 2; No. 9, Step 1; No. 11, Steps 1, 2, 3, 4.)

2b. (Optional.) Classify either logically or with reference to their relative difficulty the elements to be covered by the exercises. The purpose of the classification is to group together the elements that may properly be covered by the same exercise or direction sheet. (See Specimen Studies, No. 2, Step 2; No. 3, Step 2; No. 7, Step 2; No. 9, Step 2.)

3. Collect various types of written exercises and direction sheets from any available source. It is not necessary that such materials apply to the given subject, since the form and organization of the exercise may sometimes be adapted to any subject. Textbook exercises are usually suggestive, though no one text is likely to contain enough exercises specifically adapted to the difficulties of a given class. Samples obtained from the text may usually be supplemented until the point of the exercise is adequately covered. The collection of samples from professional literature and from other teachers should be as complete as time permits. (See Specimen Studies, No. 1, Steps 1, 3; No. 2, Step 3; No. 4, Steps 2, 3; No. 6, Steps 1, 2; No. 9, Step 3; No. 10, Steps 1, 2.)

4. Select from the samples collected, a few that apply most readily to the chosen objective. Construct exercises of the types considered most promising. (See Specimen Studies, No. 1, Step 2; No. 2, Step 4; No. 3, Step 3; No. 4, Steps 4, 5; No. 5, Steps 3, 4, 5; No. 6, Steps 3, 4, 5, 6; No. 7, Steps 3, 4; No. 9, Steps 4, 5; No. 10, Step 3; No. 11, Step 5; No. 12, Steps 3, 4.)

5. Try out the exercises in the classroom and note any difficulties caused by the form or organization of the exercise. Note also any respects in which the exercise may be improved. In constructing the first draft of the exercise it is well to become familiar with the literature concerning the preparation of such exercise materials in courses where they are regularly used, — for example, job sheets in shop courses, blue-print directions in mechanical drawing, exercises designed to teach particular methods of study as in laboratory manuals, practice exercises in arithmetic, projects in agriculture, home economics, and the like. (See Specimen Studies, No. 1, Step 4; No. 2, Step 5; No. 3, Step 4; No. 7, Steps 5, 6; No. 10, Step 4.)

6. Prepare the more specific type of direction sheet by recording as completely as possible the suggestions made to individual pupils or groups for the purpose of clarifying the particular assignment. Organize the suggestions noted, mimeograph the direction sheet, and discover points in need of revision by the questions pupils ask regarding it. (See Specimen Studies, No. 1,

Step 4; No. 2, Step 5; No. 3, Step 4; No. 7, Steps 5, 6; No. 10, Step 4.)

Supplementary Suggestions. a. Written exercises are usually of two types. One type undertakes to direct pupils' thinking, as in the content subjects of literature, social science, and natural science. The other type is more useful in the formal subjects of language or mathematics and is primarily a drill or practice exercise to develop skill. In organizing exercises of the reflective thinking type, some form of the best-answer or multiple choice test is often effective. By presenting a problem situation at the outset the exercise may require the pupil to select the important factors involved, then to select or relate methods of dealing with each factor, and finally to identify the principles involved. The drill type of exercise should ordinarily consist of separate sections, each devoted to one element of the major skill to be developed and summarized by a final section that requires the specific skills to be applied in combination.

b. The administration of exercises and guide sheets is no less important than their construction. Effective methods of using such materials in class can not be determined until the materials are prepared. It is usually wise to reserve the exercise until pupils have shown their need for more specific directions than the textbook or syllabus provides. Then assign the exercise to the pupils who need it, as a means of economizing individual explanation. Exercises may thus be

assigned either to individual pupils or to a group of pupils within the class who require the type of instruction provided.

c. Direction sheets may vary in type from a topical outline of each unit in the course accompanied by explicit directions for the study of each unit — to a brief description of methods applicable to a single assignment. The former type is in effect a textbook written for a particular course and hence must be developed over a period of years.

Type Study. — The following type study[1] illustrates the essential steps of the foregoing abstract except the last two, which call for revision of the exercise or guide sheet on the basis of classroom experiment. These steps would naturally be directed by the teacher's estimate of the reactions of a particular class and present few difficulties.

Problem. To prepare exercises for the lowest third of an eighth grade class as a means of developing efficient methods of silent reading in an introductory course in European history.

Assumptions. 1. That text materials have been selected which are appropriate to the objectives of the course.

2. That learning activities have been defined that are appropriate to the text materials.

3. That most of the difficulties met by the given class are due to inefficient habits of silent reading.

[1] Conducted by Miss Sarah Greenebaum, Graduate Student in Education, University of Chicago, 1926.

4. That such habits may be corrected by properly constructed exercises.

5. That exercises may be constructed and evaluated more conveniently if confined to a single unit of the course — e.g., the growth of Parliamentary Power in England.

Procedure. (See the foregoing Abstract of Procedure for complete list of steps.)

Step 1

"Determine learning difficulties by appropriate tests."

As noted in assumption 3, the fact that the major difficulties of the class were difficulties in silent reading was readily apparent to the teacher from the pupils' test papers, class discussion, and methods of classroom study.

Step 2

"Select significant type difficulties to constitute basis of exercises."

The objectives for each written exercise to be constructed were selected from analyses of silent reading as found in professional literature[1] — for example, (1) Acquiring and retaining meanings, plus memorizing necessary to reproduce; (2) drawing valid conclusions from material read, i.e., combining meanings properly; (3) selecting facts that are pertinent to a given question; (4) summarizing material read; (5)

[1] cf. W. S. Gray, *A Summary of Investigations in Reading*, Supplementary Educational Monograph, No. 25. University of Chicago Press.

following directions in silent reading; and (6) learning new words.

Step 2a

"Analyze selected type difficulties into specific and separate elements."

The objectives were analyzed into elements sufficiently small to be covered by single exercises. For example, the table opposite shows the types of exercise representing a few elements related to the first four objectives.

Step 3

"Collect specimen types of exercises from available sources."

Different types and forms of exercises were obtained from texts on the teaching of silent reading, standard silent reading tests, recommendations of other teachers of history, and especially from J. A. Wiley's *Practice Exercises for Supervised Study*.[1]

Step 4

"Construct tentative exercises according to most appropriate models found."

Appropriate forms for each type of exercise were readily found in the sources mentioned. The following exercises are typical:

The first exercise is intended to give practice in quickly grasping the point of a paragraph which applied to a given question. A question is asked; then pupils are given a

[1] Published by the author, Cedar Falls, Iowa.

OBJECTIVES REPRESENTING TYPE DIFFICULTIES MET BY GIVEN CLASS IN SILENT READING	EXERCISE	NUMBER OF EXERCISE	CONTENT MATERIAL
1. Acquiring and retaining meanings, plus memorizing necessary to reproduce	Brief exposure exercises — sentences and paragraphs	1 1	Mediaeval Life
	Competition in recalling question and points read	2 2 4	Peasant Revolt Magna Charta
2. Drawing valid conclusions from material read, i.e., combining meanings properly	Practice in finding first statement relative to a given question	3	Charter of Liberty
	Holding main points in mind while seeking for additional information	5	Power of Parliament
	Recognizing the elements of a paragraph	6	House of Lancaster
3. Selecting facts that are pertinent to a given question	Locating parts of selection which accurately answer definite questions	7	Tudor Despotism
4. Summarizing material read	Summarizing Making charts	8	Age of Elizabeth

reference which each one locates and reads while the teacher keeps time. As soon as each pupil finds the answers to the question, he raises his hand. The teacher then writes his rank number opposite his name on the class list. The answers are then compared and the paragraph is analyzed by the more rapid readers.

FEUDALISM

(From *Our Ancestors in Europe*, p. 214)

Why was it, that the successful men were not the men who worked, but the men who fought? (Give two reasons.)

In the Middle Ages men's lives were in danger every day from fierce Vikings or Huns or their own lawless neighbors. What man, then, would be most successful? The man who with a strong arm could protect himself, who could get possession of horses and riches and lands, the man who was strong and clever enough to take them against all comers and who could get other men to serve him. Weaker men were glad to do his plowing while he and his warriors did their fighting. They were glad to live in little huts near his castle. In wars the fighter got more land. When a king conquered countries, the fighters who helped him, received new lands.

The next illustration presents an exercise useful in raising a large question in the pupils' minds, which may serve to direct their silent reading for a considerable period of time. It is presented at the very beginning of the unit. Each pupil works the exercise independently, then answers are compared and discussed.

OUR CONSTITUTION

Why, after the European war, when so many new states were created and were adopting their forms of government, did all of them adopt the so-called English parliamentary system rather than our own? Some people give the following reasons for considering ours a good government.

It has lasted for one hundred and thirty-five years.

It was made for three million and works well for one hundred and ten million.

It was made for a small seaboard country and works for a large one.

It was made for thirteen states and works for forty-eight.

It was made for an agricultural people and works for an industrial people.

It was made for a country where there were no railroads, no telegraphs, no telephones, no radios, yet it works for the modern state.

Draw a line around the word which you think describes our constitution

unworkable hidebound elastic antiquated

Why, then, did the new countries without exception reject it and adopt parliamentary government?

We will try to find out.

Steps 5 and 6

"Improve exercises by try-out and devise a direction sheet to explain difficulties in understanding the exercises as revealed by the try-out."

These steps resulted in no important revisions of the exercises. The try-out made clear the need for many more exercises of certain types. Other types of exercise were omitted.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

[1] The thirteen types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

1. Specific difficulties of pupils in the course.
2. Types of pupil difficulties.
3. Pupil abilities or methods of work which would eliminate pupil difficulties.

SOURCES	TECHNIQUES										
	Analysis	Observation	Personal Interview	Group Conference	Question blank	Check list	Experiment	Testing	Group rating	Individual Evaluation	Sampling
Pupils in the class		**1**	**1**		**1**	**1**	**11**	**1**			**13**
Teachers			1,3,4,5, 6, 7, **9**	1,**3,4, 5, 6, 7**	1, 3, 4, 5	**1**			**11, 12**		
Supervisors			**1,3,4,5, 6, 7, 9**			1				**11, 12**	
Authorities on teaching					**3,5,6,7,9**	3, 5			11, 12		
Subject matter — Experts					3,5,6,7,9	**3, 5**			11, 12		
Professional literature											
on special methods	**3,5**,6,7,**9**										
on general methods	**3,5**,6,7,**9**										
Studies in learning	3, 5, 6, **9**										
Texts and courses of study	**3, 5, 9**										
Classroom activities	3										
Local environment		**8**									

Boldface figures indicate essential steps; others are optional.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES						
	Analysis	Individual Evaluation	Comparison	Classification	Frequency count	Organization	Sampling
Specific difficulties of pupils	**3**	**10**		**2**	10		**13**
Pupil methods of work helpful in removing difficulties	**4**						**13**
Pupil abilities helpful in removing difficulties	**4**						**13**
Elements attainable in single lesson or group of lessons			**5**	**9**		**9**	
Exercises and direction sheets collected or constructed		**9, 12**	**5**				

Boldface figures indicate essential steps; others are optional.

4. Specific elements of these abilities or methods of work which can be attained in a single lesson or group of lessons.

5. Types of exercises and direction sheets helpful in learning these elements.

6. Criteria for effective exercises or direction sheets.

7. Methods for constructing exercises or direction sheets.

8. Life applications of course useful as exercises.

9. Exercises and direction sheets helpful in overcoming pupil difficulties.

10. Most important difficulties of pupils.

11. Suggestions for improving exercises and direction sheets.

12. Most useful exercises and direction sheets.

13. Valid and reliable results.

Specimen Service Studies. — The real point of interest in the service studies of this problem lies in the findings, i.e., the actual exercises and direction sheets resulting from the investigation. Since the organization of the text does not lend itself to an extensive exhibit of findings, the reader is referred to published findings wherever possible, and the service studies outlined are selected primarily with reference to significant differences in the sources, techniques, and types of data involved.

Reading — Elementary Grades

Problem No. 1: To prepare exercises in third-grade reading for the purpose of developing paragraph comprehension.

Major Assumptions: 1. That the ability to comprehend simple paragraphs as wholes is a desirable objective in the teaching of third-grade reading.

2. That adequate criteria for evaluating reading exercises are found in the St. Cloud *Course of Study in Reading*, Gates' *Improvement of Reading*, Yoakam's *Reading and Study*, and Stormzand's *Methods of Teaching*.

Procedure: 1. Collect the criteria from the St. Cloud *Course of Study*, Stormzand, Gates, and Yoakam that are considered pertinent to third-grade reading exercises.

2. Construct tentative exercises in accordance with the criteria.

3. Ask other successful teachers of reading to rate the exercises with reference to the criteria and to offer constructive suggestions.

4. Select the exercises that receive the highest ratings and try them out in the classroom, noting points in need of revision.

Comment on Findings: 1. The exercises were based largely upon situations of the following types: (a) when the ideas of the selection are studied to see whether they are useful in solving a problem, (b) when directions are followed, (c) when titles, paragraph headings, and

other captions are considered to see whether they fit the text material that follows, (d) when two accounts of the same event are compared, and (e) when the reading is to be summarized.

2. A typical exercise required the pupils to check each topic of the following outline against corresponding paragraphs of the text (after Yoakam):

Outline for "Robinson Crusoe's Landing"

1. Robinson Crusoe makes a raft
2. He finds the sea calm
3. He gets a gun and some provisions
4. He puts them on the raft
5. He goes to the shore
6. He finds something there.

Literature — Secondary Grades

Problem No. 2: To devise exercises whereby each member of an eleventh-grade class in literature may summarize the central thought of an entire play or novel, so far as he is able and at his own rate of speed.

Major Assumptions: 1. That the piece of literature to be read is not beyond the comprehension of any member of the class.

2. That the exercise should contain some material adapted to the abilities of each pupil.

3. That such exercises based upon the given piece of literature as a whole will be supplemented by other exercises concerned with specific phases and sections of the work.

Procedure: 1. Record the ideas concerning the work as a whole that contribute to or are essential to a correct perspective. Select one such idea of major importance that lies well within the comprehension of each member of the class.

2. Select from the text as many illustrations as possible of the major ideas to be conveyed. Arrange the illustrations in approximate order of difficulty.

3. Examine published tests in English literature and select such forms as are considered likely to stimulate pupils' reflection upon the idea to be stressed by the exercise.

4. Commencing with the simpler forms, prepare the easier illustrations for pupils to examine in relation to the central idea; then proceed with the more difficult illustrations organized in whichever of the test forms best suits the material.

5. Assign the exercises to be worked and discussed in class. Revise the points found to cause confusion and such other items as do not directly serve the purpose of the exercise.

Comment on Findings: 1. The procedure outlined was found applicable with minor adaptations to any work of literature prescribed.

2. The following example[1] represents the final draft of an exercise designed to emphasize the psychological implications of Macbeth, after the class had read the play through rapidly.

[1] *Journal of Educational Research*, loc. cit. Quoted by permission.

Answer the following questions in order with the aid of the text:

1. Taken as a whole, is the play true to life as you know it? Yes..... No.....
2. Check all of the following statements which could be used to support your reply to the question above:
   a. There are no such things as ghosts and witches in real life.
   b. The ghosts and witches in the play merely represent the guilty conscience of Macbeth and do not affect the other characters.
   c. A friend of the king like Macbeth would have more to gain by letting Duncan live than by killing him.
   d. When a small act of dishonesty succeeds very well it is likely to encourage a man to become more and more dishonest.
   e. A delicate and sensitive woman like Lady Macbeth would not be likely to dare her husband to prove his love by committing murder.
   f. Weak women are often more ambitious than more self-reliant women.
   g. Many sensitive women can steel themselves to desperate acts, but after committing the act their nervous energy leaves them and they become pitifully weak.
   h. If she had been wicked enough to drive her husband to murder Duncan, Lady Macbeth would not have weakened sooner than Macbeth himself.

3. Copy the letters corresponding to the above sentences which you have checked and write numbers after each one referring to the pages and lines of the text which tend to show that the statement is true.

French — Secondary Grades

Problem No. 3: To construct drill exercises for use in teaching the grammatical rules most frequently mistaken in first-year French.

Major Assumptions: 1. That the course of study prescribes certain rules of grammar and syntax to be mastered.

2. That the exercises contained in the textbook do not provide sufficient practice upon the rules most generally violated.

Procedure: 1. Record the significant errors made by pupils in test papers, notebooks, composition exercises, and oral composition. Determine frequency of each type of error.

2. Select the errors considered most serious and arrange them in order of increasing difficulty to learn. Submit the list of errors so arranged to other teachers, asking them to revise the order where desirable.

3. Compose French sentences containing the errors that pupils may correct by applying the proper rule. Also prepare English sentences to be translated to French that involve the same rules.

4. Assign the sentences to be treated as classroom exercises and revise them in accordance with the class response.

Comment on Findings: 1. The exercises proved effective for the majority of the class; especially the French sentences for correction.

2. After the pupils became familiar with the pro-

cedure, the collection and classification of pupils' errors was made a class exercise in itself, thus reducing the teacher's labors considerably and providing continuous practice in the detection of errors.

Civics — Secondary Grades

Problem No. 4: To construct guide sheets and exercises for a given unit in a ninth-grade Civics course.

Major Assumptions: 1. That the objectives for the unit have been determined and analyzed into desired outcomes, representing different elements of the given unit.

2. That the desired outcomes (in terms of understandings, attitudes, abilities and skills) have been related to the specific topics of subject matter by means of which they are best taught.

Procedure: 1. Determine what sort of learning product is desired in each element of the unit. For example, one element in the unit "Immigration" is "Immigrants have contributed a great deal to American development." The desired outcome here is largely one of "A favorable attitude toward immigrants," as distinguished from understanding. Exercises are needed to develop such an attitude.

2. After the types of exercise are determined, examine a number of texts in the field, noting any exercises found to be appropriate. Examine texts in other fields for suggestive exercises; for example, a text in general science may contain an exercise that may

be adapted to the unit. Examine other books which might suggest other forms of exercise and record them similarly.

3. Classify the exercises noted according to the type of learning activity each involves.

4. Select exercises for each element of the unit in order. Try to select two or three exercises of different kinds for each unit. The learning product may require one type of exercise for one pupil and another type for other pupils.

5. Then select summary exercises which interrelate the elements so that the pupil will have his attention focused upon the unit as a whole.

Comment on Findings: 1. Specific elements of the unit were best adapted to exercises of the type that require the pupil to apply a given topic to a wide range of situations within his personal experience, as in preparing lists of applications, checking examples, et al.

2. Exercises useful in relating the separate elements were more largely of the summary paragraph type.

American History — Secondary Grades

Problem No. 5: To devise exercises useful both in directing the attention of a large class to the text materials assigned and in stimulating class discussion.

Major Assumptions: 1. That the course of study and administrative conditions require the teaching of historical facts as such.

2. That the size and disposition of the class necessi-

tates a type of exercise that will hold the attention of each pupil by virtue of the definite responses called for.

3. That no study of the text outside of class may be counted upon in the case of a majority of the pupils.

Procedure: 1. Accept the chapter divisions of the prescribed text as the unit divisions of the course.

2. Go through a given chapter and check the sentences containing facts essential to an understanding of the historical events and tendencies discussed. Underscore the essential word or phrase in such sentences.

3. List about five or less of the social problems upon which the facts contained in the given chapter most directly bear. The problems listed should be represented so far as possible by current events or by discussions in contemporary literature read by pupils.

4. Mimeograph the selected sentences, omitting the underscored words, and assign them as exercises. Direct pupils to supply the missing words with the aid of the text during the class period.

5. When the class has discussed the exercises and acquired the necessary acquaintance with the facts contained in the chapter, introduce the contemporary problems for discussion and require pupils to solve or explain the problems by means of the facts.

Comment on Findings: The following exercise is typical:

THE MEXICAN WAR

1. The three important issues between the U. S. and Mexico were .....; .....; .....

2. The incident that directly brought on the war was the ..... on the ..... soldiers on the Rio Grande.

3. ..... commanded the American forces in Northern Mexico.

4. He fought the important battle of .....

5. ..... commanded the American forces in Southern Mexico.

6. He fought the important battle of Chapultepec and captured the city of .....

7. The treaty of peace was signed at ..... in the year of .....

8. The treaty of Peace provided that (a) Mexico ceded to U. S. the territory including the states of ..... and ....., (b) that Mexico acknowledge the annexation of ..... by the U. S., (c) The Southern boundary line run along the ..... river, (d) the U. S. pay Mexico ..... dollars.

9. U. S. was justified in declaring war on Mexico on the grounds that (a) Mexico had refused to receive our ...., (b) Mexico had ..... our flag, (c) Mexico had plundered and interfered with our .....

Problem: Discuss the diplomatic relations with Mexico and with Nicaragua at the present time with reference to the previous relations between the United States and Mexico. Supply any evidence you can that helps to present a more accurate statement of fact than the statement contained in the text.

Ancient and Medieval History — Secondary Grades

Problem No. 6: To construct a guide sheet and exercises for a unit on "Feudalism and the Crusades" to be taught in a sophomore history course.

Major Assumptions: 1. That the objectives and subject content of the unit, as already established, are satisfactory.

2. That it is possible and desirable to determine for a class essential *activities* in the same way that we establish essential *content* and essential *understandings*.

Procedure: 1. Make a list of possible exercises for the unit by consulting the "Things to Do" sections in chapters on "Feudalism" and "The Crusades" in all available texts, manuals, study guides, etc.

2. Supplement this list of possible things to do with exercises suggested by personal experience and by other teachers.

3. Set the list of "Possible Things to Do" alongside the list of objectives and the statement of subject content for the unit. Carefully select, on the basis of personal judgment, the activities that (1) are most successfully performed with the given content, and (2) that help most to bring about the desired learning.

4. Check the value of the types of exercises chosen against the evaluation of such activities by authorities such as Dawson, Johnson, Klepner, Tryon, and other authors of texts on the teaching of the social studies.

5. Submit the personal judgments as checked to

other experienced teachers (preferably colleagues familiar with the local situation).

6. On the basis of the criticism by colleagues, formulate the guide sheet by listing the exercises in the proper teaching order and by prefacing each with such directions as are necessary to make the purpose of each exercise clear to each pupil.

Comment on Findings: For an example of the types of exercises developed see Section 3, Chapter III.

Arithmetic — Elementary Grades

Problem No. 7: To construct exercises and direction sheets needed to clarify the materials relating to "division" for a particular fourth-grade class.

Major Assumptions: 1. That the desired outcomes and appropriate subject matter are wisely chosen and specified in the course of study.

2. That the pupils represent a wide range in intelligence and in ability to handle arithmetical combinations.

3. That the assignments in division as outlined in the course of study are too complex for pupils to understand and consequently need to be simplified by analysis into their elemental steps.

Procedure: 1. Apply a series of standardized diagnostic tests in the fundamentals of arithmetic and determine the specific errors in division as indicated by the results.

2. Classify the errors by grouping together those in-

volving the same step or rule of division. Select one such group of errors as the basis for an exercise.

3. Analyze the single step by reducing it to its elements and by collecting simple examples to which the step applies. Mimeograph a large number of such examples, so organized that the one step or rule may be applied to groups of examples in order of increasing difficulty. Supply enough examples so that any pupil who succeeds in working them all can scarcely fail to understand the rule.

4. Prepare similar exercises for each of the other groups of errors or steps. Then prepare exercises in which two or more steps are combined.

5. Assign the exercises to be worked in the classroom and observe the more backward pupils to note difficulties presented by the exercises themselves.

6. Write out simple directions toward overcoming each difficulty, with the aid of other teachers if necessary. Supply illustrations to make the directions clear. Place the directions in a conspicuous place on the board for pupils to refer to while working the exercises.

Comment on Findings: 1. Much help in the analysis of each step was found from G. T. Buswell's *Diagnostic Studies in Arithmetic* and other researches that interpret the difficulties of problem cases in arithmetic.

2. The direction sheets placed on the board were found by other teachers to contain all the suggestions needed to explain the exercises, but the directions were seldom used to advantage until the teacher applied

the suggestions to the difficulties met by individual pupils.

Algebra — Secondary Grades

Problem No. 8: To develop exercises and direction sheets to guide practice in the specific difficulties met by a given ninth-grade class in the unit "Factoring."

Major Assumptions: 1. That the desired outcomes and the textbook are wisely chosen for the given class.

2. That the exercise materials contained in the text need to be supplemented and carried to greater detail in order to remove the specific causes of difficulty encountered by about one third of the class.

Procedure: The procedure herein followed was so similar to the procedure outlined for Problem No. 7, that the steps of the foregoing study may be substituted.

Comment on Findings: 1. Much help in identifying specific difficulties in Factoring were obtained from professional literature, especially E. L. Thorndike *The Psychology of Algebra* and Smith and Reeve *The Teaching of Junior High-School Mathematics.*

2. The organization of the exercise materials was in large part suggested by exercises selected from a variety of junior high-school texts and from G. E. Atwood, *Exercises in Algebra.*

3. The direction sheet was prepared as described in Problem No. 7 but was mimeographed and distributed to each pupil. The directions here proved highly use-

ful in economizing the teacher's time for individual work with problem pupils during the period.

Hygiene — Elementary Grades

Problem No. 9: To prepare problem exercises and direction sheets for use in applying health principles to familiar life situations in a sixth-grade course in hygiene.

Major Assumptions: 1. That the desired outcomes and prescribed subject matter of the course are well adapted to the grade and to the pupils of the given class.

2. That the desired outcomes of the course emphasize the need of teaching health principles for the primary purpose of improving the pupils' personal health habits.

3. That the prescribed text materials fail to relate the principles to health situations that are sufficiently vivid to produce the desired effect upon conduct.

Procedure: 1. Collect material representing occasions for the application of health principles by consulting local physicians, school nurses, selected parents, vital and health statistics from city and county bureaus, popular but accurate books and articles on health, publications of the Red Cross and other health associations, insurance company publications, health articles in the daily press, other school courses of study, and such books as *Modern Science and People's Health*, *The Human Body* (Clendening), and *Health Hazards in Industry*.

2. Classify the data obtained from the foregoing sources according to the units of the course of study.

Edit the facts in the form of specific case situations describing illnesses and disorders to which the pupils and occasionally their parents are susceptible.

3. From professional literature select the forms and types of exercise best calculated to arouse pupils' interest in selecting effective precautions and remedies for the situations. Examine also the literature on the use of class projects in science teaching for further suggestions.

4. Prepare abstracts of the remedies described in each unit of the prescribed course of study. Submit to the class the abstract for a given unit, together with the problem situations related to the unit, and have pupils work out methods of applying the health remedies to the conditions described in the problem exercises.

5. Supplement the problem exercises by such material in the form of direction sheets as will encourage pupils to apply the remedies to the improvement of their personal health habits or by directions that save the teacher's time in explaining the exercises.

Comment on Findings: 1. The most successful type of exercise was found to be a paragraph describing the nature and effect of a specific physical disorder, followed by a list of more or less useful remedies from which the pupil was required to select the best. The pupil was in addition required to explain his reasons for selecting certain remedies on the basis of the facts contained in selected textbooks and leaflets.

2. Considerable use was made of the direction sheets as a means of outlining specific health projects and health practices to be carried out at home. These were checked by having parents report on the pupils' improvements and by having pupils rate themselves on the habits at regular intervals.

Physics — Secondary Grades

Problem No. 10: To prepare problem exercises for use in emphasizing applications of the principles contained in a chapter on "The Mechanics of Solids" from a textbook in Elementary physics, tenth grade.

Major Assumptions: 1. That the objectives of the course require the emphasis of applications as a means of understanding the principles.

2. That the chapter contains material needed by the given class.

3. That the illustrative problems contained at the close of corresponding chapters in a variety of textbooks in physics are sufficiently comprehensive to suggest the exercises needed to give pupils practice in applying the principles.

Procedure: 1. Collect copies of all recent and reputable texts in high-school physics. Select such of the problem exercises found in each book as are related to the principles of mechanics and such as represent important and interesting applications of the principles.

2. Classify the problems under the appropriate prin-

ciples and submit them to other teachers for criticism. Ask each teacher to indicate the problems considered most likely to help pupils to understand the given principles.

3. Select the problems approved by the teachers as the basis of the exercises to be developed. Present the problem with enough supporting detail to make the situation seem real. Then follow the problem with a series of questions, directions, statements, diagrams, or other material designed to suggest the principles whereby the problem may be solved.

4. Apply the exercises so constructed to the class and revise where necessary.

Comment on Findings: 1. Pupils' interest in the problems was found to depend chiefly on their appeal to common sense. The problems selected from the physics texts were found on the whole to involve too much mathematics for almost one-third of the class. This defect was remedied by adding to the exercise for the given chapter some simpler problems obtained from general science texts. The original problems were then attacked with greater confidence, interest, and success.

2. The mathematical difficulty was met by introducing formulas of increasing complexity in the general science problems. The exercises so constructed served as the basis for the instruction in mathematics needed to solve the original problems from the physics texts.

Garment Construction — Secondary Grades

Problem No. 11: To prepare exercises and guide sheets for a tenth-grade course in domestic science, the purpose of the exercises being to teach pupils to think for themselves, i.e., to understand pattern directions instead of following the directions blindly.

Major Assumptions: 1. That the objectives and units of the course in garment construction are wisely chosen for the given class.

2. That the course of study emphasizes skill in the following of directions to the virtual exclusion of problems requiring independent thinking.

3. That to teach independent planning some type of exercise materials are necessary to supplement the course of study.

Procedure: 1. List the construction processes — stitches, methods of cutting to pattern, etc. — involved in each unit of the course.

2. List the kinds of fabrics to which the constructive processes may be applied in the construction of certain garments that the girls wish to make for personal use.

3. List the difficulties commonly met in applying each process to the fabrics suitable for the types of garments made.

4. Describe the methods of overcoming the difficulties listed, with the aid of other teachers, sewing manuals, and literature on methods of teaching sewing.

5. Prepare exercises for class use by stating the problem in a brief paragraph and requiring the girls to solve it by means of the methods described, the list of fabrics appropriate to the type of garment, and the constructive processes that may be used to accomplish the desired result.

Comment on Findings: The following exercise is typical.[1]

EXERCISE 1. SELECTING TYPE OF SEAM

Types of Seams

A. Flat fell
B. Tailored fell
C. French
D. False French
E. Plain
   1. Edges finished by pinking
   2. Edges finished by machine stitching
   3. Edges finished by over casting
   4. Edges finished by binding
   5. Edges finished by turning and using running stitch
   6. Edges finished by picot

Possible Reasons for Selecting the Above

a. Quickly made
b. Leaves no raw edge
c. Easily pressed
d. Strong
e. No stitching on right side of garment
f. Requires no handwork in finishing
g. Not bulky
h. Has more tailored finish
i. Stitching on right side of garment not bad
j. More easily made due to nature of material
k. Prevents ravelling.

[1] Reproduced by courtesy of Miss Margaret L. Brew, School of Education, University of Chicago.

Directions

Place the capital letter of the seam you think should be used and the small letters indicating the reasons for your choice in the appropriate spaces below.

Problem: To select the best type of seam in constructing:

	UNDERARM SEAM	SHOULDER SEAM	SET-IN SLEEVE
Dress			
linen			
gingham			
ratiné			
voile			
organdy			
satin			
silk crepe			
taffeta			
poiret			
flannel			
wool jersey			
wool poplin			
chiffon			
roshanara crepe			
bengaline			
challis			
Undergarment			
nainsook			
gingham			
cotton crepe			
crepe de chine			
rayon knitted silk			
pongee			
Blouse			
English broadcloth			

Art — Secondary Grades

Problem No. 12: To construct exercises providing practice in applying the principles of balance to the unit of interior decoration.

Major Assumptions: 1. That the objectives of the unit require pupils to develop skill in applying the art principles studied.

2. That such skill must be developed by reproducing problems in the form of exercises whenever facilities for the decoration of actual rooms are not available.

Procedure: 1. Obtain a list of the respects in which art principles are most generally and most seriously violated by casual visits to pupils' homes, if possible; otherwise by submitting designs of different types of rooms furnished and decorated in various ways to obtain expressions of individual taste and preference.

2. Select for special emphasis such of the principles contained in the unit as may be applied to the improvement of interior effects that are inartistic but not recognized as such by a majority of the pupils.

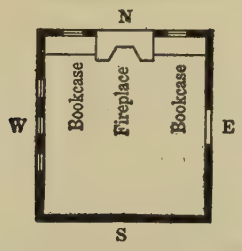
3. Devise practice exercises wherein pupils are required to apply the principles of balance to a series of art forms to distinguish occult, bi-symmetrical, and non-balancing forms.

4. Devise a problem exercise wherein the same principles are to be applied to the arrangement of furnishings in a typical room. Then compare the results and require pupils to improve their individual designs, with reasons stated.

Comment on Findings: The following problem exercise was developed for the unit on interior decoration and furnishing:

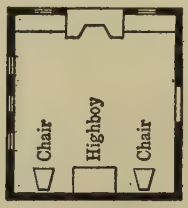
A room containing a fireplace on north wall with book-

FLOOR PLAN A



SOME POSSIBLE ARRANGEMENTS

1



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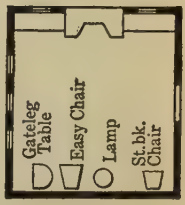

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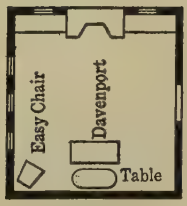

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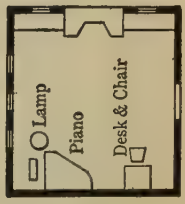

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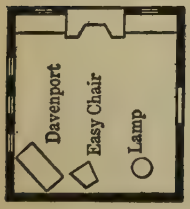

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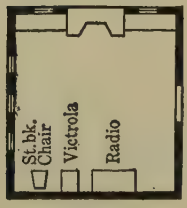

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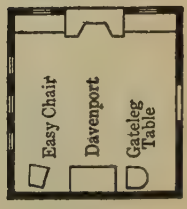

9

Consider only the balancing of South with North wall

cases on either side and windows above. How might the south wall be balanced?[1]

1. "Consider the accompanying diagrams. Which of the possible arrangements do you consider the best, which one second best? Why? Which are poor ones? Why? Consider only the balancing of the south wall with the north wall.

2. To develop a fuller understanding of the problem the following procedures have been employed:

a. Have students consider a room which all may visit. Conduct discussion as to good and bad arrangement.

b. Have students draw floor plan A. Cut floor plan furniture to scale and make all possible arrangements on A.

c. Have students draw floor plan of their room as it is. If they believe it artistic, submit only the one sketch. If not, submit corrected sketch with original.

d. If facilities are available, use a room in which the furniture can be re-arranged. Divide students into groups and let each group make arrangements to be criticised by the other groups.

e. Construct a model room, which can be varied in width, height, and depth. With ample supply of furniture let students make arrangements for rooms of different shapes and sizes.

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[1] By courtesy of E. E. Lowry, Supervisor of Art, Public Schools, Winston-Salem, N. C.

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4. MOTIVATING

(Type Problem II C)

Motivation is the term used to cover the various ways of arousing interest in learning. Considered positively, motivation has to do with the selection of subject matter and methods of learning that appeal to the members of a given class. Regarded negatively, motivation consists in locating and removing the specific conditions that prevent one or more pupils from cooperating with the teacher in the work. Problems of motivation enter into almost every teaching situation. Such problems, furthermore, are essentially subjective. Problems of motivation thus present serious difficulties to the investigator on account of their nature and scope. Yet the extreme importance of successful solutions makes it necessary to investigate the problems by the best methods available.

The service study, as compared with the research, tends to simplify the investigation considerably. To find methods whereby *pupils in general* may be interested in their work is a problem which after centuries of unsuccessful efforts is only now becoming capable of scientific analysis, and solutions are still far to seek. To discover the methods by which a *given class* of pupils may be stimulated is far simpler, since, with a

given group, the effects of various stimuli may be determined for each indifferent pupil. The types of stimulus most effective with a majority of the class may thus be selected by experiment. There are, moreover, other methods of investigation applicable to the pupils in a given class. These procedures are defined and illustrated in the present section.

Problems. — As a basis upon which to select the service study procedures, it is helpful to specify the sub-problems or elements of the general problem. Speaking generally, there are some six typical sub-problems usually revealed by the analysis of any problem in motivation. While all six are usually present, they differ greatly in their relative importance to the given situation. Since several of the sub-problems require different techniques of investigation, it is well to identify the sub-problems of major importance in the particular class and course so that the procedures most appropriate to the important sub-problems may be selected.

The six sub-problems are as follows:[1] (1) to determine the personal traits that the teacher should express in order to secure the cheerful cooperation of the given class; (2) to identify the dominant interests of the class as a whole or of individual pupils within the class; (3) to find classroom activities pertinent to the work that provide sufficiently for pupils' self-expression; (4) to identify the items of prescribed or

[1] Cf. Douglas Waples, *Problems in Classroom Method*, pp. 172-176.

supplementary subject matter that are most intrinsically appealing to the given class; (5) to identify methods of directing group work to which the class best responds; (6) to identify the particular rewards and penalties that offer the strongest incentive to individual pupils.

It will be noted that, with the exception of the first, each of the sub-problems is capable of investigation when confined to a given class. It is seldom possible to investigate the first, since the identification of desirable personal traits depends largely upon the judgments of competent critics, which are not easily obtained by the classroom teacher. The remaining five problems, however, can be investigated to good purpose by procedures of three types, or by a combination of such procedures.

Perhaps the most obvious type of procedure is the classroom experiment to determine which of several kinds of subject matter, methods of learning, or methods of teaching are most stimulating. Experiment must be used also to select the specific devices by which to provide motivation indirectly — as in the selection of rewards and penalties. The experimental type of procedure is illustrated by the provision of various supplementary readings from which each pupil may take his choice, the most interesting selection being indicated by the frequency with which each selection is chosen. In much the same way it is possible to select methods of learning and teaching experi-

mentally, with reference, of course, to the particular pupils concerned.

A second type of procedure consists in the collection of content materials and learning methods. It is often possible for the teacher to select the most interesting item or method by inspection when it appears in a master list of such items or methods. Not until a teacher of botany has systematically collected the various ways of adding interest to field trips, for example, is it easy to tell whether or not the field trips are as strongly motivated as possible. When a virtually complete list of the devices appropriate to the given course has been prepared, it is usually a simple matter to select for trial all the good devices that may be well combined or introduced successively for sake of variety.

A third type of procedure consists in the collection of information regarding the causes of pupils' indifference, the out-of-school interests of pupils, and such other facts as may constitute criteria in selecting effective means of motivation. Assuming that the available incentives are known, it is often too much of an undertaking to select the best means experimentally, yet the selection becomes easy when the teacher has collected the necessary facts regarding individual pupils. Whether a particular class in primary reading is more likely to be interested in stories of fishermen or stories of farmers might, of course, be determined experimentally; yet the experiment be-

comes unnecessary when the teacher knows how many members of the class go to the river to fish, how many have been on farms, and which of the activities is preferred by the class. This principle may be extensively applied to economize experiment by substituting facts obtained through simple methods of class or individual diagnosis.

Referring back to the five sub-problems capable of investigation by service study procedures, the reader will note that all three types of procedure may be applied to each problem. The order in which the types are applied should follow the order of the foregoing paragraphs, except where pupil diagnosis may be substituted for classroom experiment. Ordinarily classroom experiment is the simplest and most conclusive means of selecting incentives for a given class. When the devices to be applied experimentally are not already known, the second procedure must be used to determine what devices are applicable. Similarly, when it is not possible to formulate appropriate devices without specific facts concerning the temporary and characteristic interests of the pupils concerned, the procedure of pupil diagnosis is in order.

Assumptions. — The wide scope of most problems in motivation requires the same use of assumptions to bring the problems within reach of the service study that has been emphasized in other problems of large scope. The assumptions here are of two types, one covering factors that lie beyond the problem of moti-

vation itself and the other type serving to exclude the sub-problems of motivation that have least importance in the given situation.

The assumptions of the first group are three; namely, (1) that the objectives and desired outcomes have been wisely defined for the given class, (2) that the prescribed and supplementary subject matter is appropriate, and (3) that the basic methods of learning are efficient when used to produce the desired outcomes by means of the subject matter prescribed.

The assumptions of the second group may be covered by the general statement that the results of the investigations of each of the sub-problems chosen for study must be assumed to be in harmony with the results which would be obtained if the remaining sub-problems were investigated. That is to say, suppose the investigator seeks only to determine the activities in arithmetic which provide sufficiently for pupils' self-expression. It must be assumed: (1) that such activities when collected can be directed by a teacher who expresses personal traits which secure the co-operation of the class; (2) that such activities are in harmony with the dominant interests of the pupils; (3) that such activities can be used in connection with the prescribed subject matter; (4) that such activities may be directed by methods to which the class will respond; and (5) that such activities involve the particular rewards and penalties that offer the strongest incentive to individual pupils. Thus any problem in

motivation may be reduced to the scope of the particular sub-problem chosen.

Type Procedure. — The foregoing procedures are elaborated in the following outline. The order in which they are presented is based on the assumption that as many sub-problems as possible will be investigated in the given class.

The Problem. To identify the specific conditions responsible for the failure of individual pupils to cooperate satisfactorily in the class work; also to determine methods of removing such conditions and of increasing the energy with which the pupils undertake specified assignments; also to collect the information regarding pupils that is needed in defining the methods to be applied.

Abstract of Procedure. a. (Optional.) Apply group tests based on the desired outcomes of the units or stages of the course already covered by the given class. Apply some reliable group test of mental ability. Compare the results of both tests to identify pupils whose rank on the subject matter test is conspicuously below their rank on the test for mental ability. (See Specimen Studies, No. 2, Step 1; No. 5, Step 1; No. 8, Step 1.)

1. Interview about five of the pupils who are apparently making least use of their abilities as judged by observing them at work. Ask each pupil specific questions regarding the nature of his difficulties in the course, his interest in it, the features of the course

which he considers unnecessary or least interesting, his interest in the school as a whole. Record the replies in detail at the time of the interview. (See Specimen Studies, No. 1, Step 1; No. 2, Step 2: No. 5, Step 2; No. 8, Step 2.)

2. Study the information obtained from the interviews and note the causes for lack of interest which apply to all of the pupils interviewed and which may well apply to the class as a whole in less degree. (See Specimen Study, No. 5, Step 4.)

2a. (Optional.) Follow up the interviews by preparing a check-list by which to obtain similar data regarding all pupils. List in some detail the features of the course which are most likely to prove objectionable to pupils. List the more obvious points of contact between the subject and the pupils' familiar experience or outside interests. Leave spaces in which pupils are asked to describe or list certain features of other courses they find most interesting. List the out-of-school activities normally interesting to pupils of the given grade, asking pupils to check their preferences and to add other interests not listed. (See Specimen Studies, No. 2, Step 2; No. 5, Step 3; No. 8, Step 3.)

2b. (Optional.) Summarize the returns from the check-list and test their validity by using the five pupils interviewed as a basis for comparison. List the causes for indifference most prevalent in the entire class and note also the present interests of the group

that are most readily transferred to the classwork. (See Specimen Studies, No. 8, Step 3.)

2c. (Optional.) Consult school records and former teachers of the class to discover any other reasons for pupils' poor work than lack of interest; such as the nature of previous work in the subject, transfer from other schools, home conditions, and similar reasons suggested by the given environment.

3. Consult professional literature for methods of providing incentives to pupils of the given grade. Also consult books and articles on methods of presenting the given subject effectively. List any suggestions found in the reading that are sufficiently specific to apply to the given class. Also observe pupils in class, on the school premises, at homes, and elsewhere, to determine activities in which they are interested. Interview parents to discover activities in which their children are most interested. (See Specimen Studies, No. 1, Steps 2, 3; No. 2, Step 4; No. 3, Steps 1, 2, 3; No. 5, Step 5; No. 6, Steps 1, 2; No. 7, Step 1; No. 8, Step 4.)

4. Interview other teachers of the class and parents and ask for suggestions toward removing the causes of indifference previously identified. Ask them also for other suggestions toward making the work in general more interesting — e.g., finding vivid illustrations, presenting stimulating problems, organizing class work on an individual basis, relating the work more closely to outside interests, developing a general plan of work in

which each pupil may cooperate, introducing novelty in the work, and the like. Question the teachers until their suggestions are explained in detail and concretely illustrated; then write them down for future reference. (See Specimen Studies, No. 2, Step 3; No. 3, Step 3; No. 5, Step 5; No. 6, Steps 1, 2; No. 7, Step 1; No. 8, Step 4.)

5. Classify the suggestions received according to the causes for indifference. Group together the suggestions that are of such a character that they may be applied to the class at one time or in one teaching operation. (See Specimen Studies, No. 3, Steps 4, 5; No. 4, Step 4.)

6. Apply the suggestions when they have been organized in proper sequence. Note the improvement in class attitude as an indication of success. Continue until the appropriate suggestions have all been experimentally applied. (See Specimen Studies No. 1, Step 4; No. 2, Steps 5, 6; No. 3, Steps 2, 4, 5; No. 4, Step 5; No. 5, Step 5; No. 6, Steps 3, 4, 5, 6; No. 7, Steps 2, 3, 4; No. 8, Steps 4, 5.)

6a. (Optional.) If no improvement is noted in the pupils' attitudes, invite some other successful teacher of good judgment to criticise the procedures used and to visit the class as an observer. Ask the teacher to note particularly any of the teacher's personal traits or mannerisms that may cause indifference. Note and follow up any specific criticisms, whether of methods used in applying incentives, the incentives themselves,

or of more fundamental factors such as the prescribed subject matter, the organization of the course, and the methods of learning assigned.

Type Study. — The study chosen to illustrate the foregoing procedure is addressed to a problem of large scope. The problem concerns an entire department rather than a single teacher and class. Consequently the findings of the study were applied in different ways by different teachers.

Problem. To determine effective methods of motivating voluntary reading by junior high-school pupils in an industrial community from which few pupils enter the senior high school.

Assumptions. 1. That the objectives of the program in general and of the English department in particular require the development of interests in profitable reading on the part of pupils who leave school at the close of the ninth grade.

2. That the development of such interests involves cooperation between the English department of the given school and the local librarians.

3. That the list of 110 methods of arousing interest in reading, prepared by W. F. Rasche[1], is sufficiently complete to suggest all effective methods.

4. That the teachers and librarians concerned are competent to select for experiment the methods each

[1] *Methods Employed by Teachers and Librarians to Stimulate Interests in Reading*, Master's Thesis, 1927, Department of Education, University of Chicago.

is best qualified to apply to different groups of pupils.

Procedure. (See the foregoing Abstract of Procedure for complete list of steps.)

Steps 1 and 2

"Interview selected pupils to obtain statements regarding specific difficulties and special interests."

"Study the data obtained and note causes for pupils' indifference."

A summary of the data obtained from the representative pupils interviewed shows the following major causes for the given pupils' lack of interest in reading: (1) "can't understand the books assigned"; (2) "rather read magazines with pictures and advertisements"; (3) "no time to read either in school or at home"; (4) "too much reading of school books in school and so do not want to read after school"; (5) "like to read the books at home more than the books the teacher wants us to read"; (6) "can't get the books I want in the library, they are always out"; (7) "more interested in doing things than in reading"; (8) "I don't know what you mean by 'good' reading"; (9) "the school library is too small and too dark to read in"; (10) "don't like to read books about other books"; (11) "the books in the library are not the kind I like to read."

Step 3

"Collect useful incentives from literature, from parents, and by observing pupils both in school and out."

On the basis of assumption 3, the methods of overcoming the foregoing causes were selected from the one source mentioned in the foregoing footnote. The following methods were selected as appropriate for general use by all teachers. Each teacher made an independent selection of the methods considered best suited to the particular classes.

Organizing ability groups
Having pupils study advertisements
Using advertising devices
Permitting free-period and after-school reading
Developing proper attitudes
Luring pupils by "baiting"
Having pupils prepare booklets
Having pupils keep book records
Establishing book reserves
Having pupils bring books
Providing a browsing corner
Using the bulletin board
Having pupils interpret cartoons
Preparing and using catalog cards
Having pupils study characters
Preparing and having pupils prepare charts
Inviting children's criticism
Appointing child librarians
Allowing pupils freedom of choice
Arranging for circulation of reading matter
Allowing civic use of public library

Providing a classroom library
Providing classroom magazines and newspapers
Asking pupils to bring clippings
Filing clippings in pamphlet boxes
Encouraging reading clubs
Making deserved commendations
Having pupils make comparative studies
Capitalizing teacher-pupil and librarian-pupil conferences
Organizing contests
Requiring correlations with the school subjects
Giving reading credit
Assigning studies in current events
Encouraging debates
Making diagnoses of pupils' interests
Having pupils carry out directions as found in printed instructions
Stimulating discussions
Preparing displays of books and magazines
Assigning dramatizations
Arranging assembly and classroom exercises
Arranging exhibits of pupils' handicraft work
Having pupils play games
Having pupils study illustrations
Teaching recognition of inferior reading materials
Setting up interest in topics discussed
Providing attractive library buildings
Having pupils get library cards
Preparing book lists
Making personal loans of books and magazines
Binding magazines
Classifying magazines into groups
Filing magazines for reference
Featuring special magazine sections
Using good methods in the mechanics of reading

Supplying appropriate motivation
Recommending moving pictures based on good literature
Using objects as illustrative materials
Assigning parallel reading
Inviting parental cooperation
Doing partial reading or telling
Encouraging pupils to build personal libraries
Using pictures
Encouraging pupils to read for pleasure
Using posters
Putting individual reading records on progress charts
Having pupils develop projects based on reading
Encouraging pupils to use the public library
Circulating public library school collections
Providing good reading materials
Allowing reading periods
Giving selected readings to pupils
Assigning required readings
Having pupils prepare reports
Having reviews read and prepared
Having pupils engage in mock salesmanship
Using school papers to stimulate interests
Featuring seasonal books
Making appropriate selections of reading materials for the library
Having pupils follow sequences
Having pupils read serial stories
Showing literary slides and films
Making provision for spare time reading
Providing special shelves for boys and girls
Having pupils make statistical studies of class interest in fiction and non-fiction
Programming story telling periods
Encouraging subscriptions

Making desirable substitutions
Making suggestions and recommendations
Arranging for talks by librarians and others
Taking pupils on real or imaginary tours and visits
Discouraging undesirable reading
Teaching proper use of reading materials and libraries

Step 4

"Obtain suggestions from teachers toward removing the particular causes of indifference noted."

The more explicit statements and illustrations of each method that are needed in order to apply it to the given classes were obtained also from the study referred to and were further adapted to the pupils' needs by the individual teachers. The following represents the more detailed description of one method from the foregoing list, together with a critical comment. Similar data are found in the references for each of the one hundred and ten methods.

Master Method No. 33

Having Pupils Make Comparative Studies

Variations of the master method — The following variations of the master method were reported:

1. Dime novels — Contrasting good reading and
2. English — Comparing books for
3. Oral reviews — Using (to develop class judgment)
4. Overdrawn characters — Pointing out
5. Plots — Comparing (of books to note weak points)
6. Standards — Setting (of comparison)
7. Types of readers — Studying what different (read)

Specimen Procedure: Compare books in oral reviews.

The undesirable types suffer by comparison with the best. In several cases where a lighter type of book was reviewed the judgment of the class was swiftly and forcibly expressed against it without any word from me to indicate my thought or feeling concerning it. Occasionally I ask students found reading undesirable books to read others of a higher grade at the same time and to draw their own conclusions. Sometimes I have persuaded girls with the statement that "all cultivated persons know this book."

Critical Comment. This procedure is used primarily to elevate tastes in reading. To use it effectively the teacher or librarian must provide proper standards by which to judge the materials read. The reports state in the main that pupils are expected to make comparative studies. The reports fail to indicate what are proper standards for making such comparisons. Workers using this method have some standards in mind. These undoubtedly vary from individual to individual. We are in need of a clear definition of such standards and may well project various experiments seeking evidence of the relative effectiveness of the standards after they have been defined.

Step 5

"Classify incentives applicable to indifference resulting from the same cause."

The classifications were made by each teacher independently, since no two teachers selected precisely the same methods from the general list.

Step 6

"Apply incentives experimentally."

The application of the selected methods was simple in all cases except where additional funds were required

for the purchase of materials or for the improvement of school and library facilities.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

1. Mental ability and degree to which pupils are attaining objectives of the course.
2. List of pupils not attaining objectives commensurate with ability.
3. Pupil difficulties in the course.
4. Causes of pupil difficulty.
5. Items in course interesting to pupils and items towards which they are indifferent.
6. Causes of pupil interests.
7. Causes of pupil indifference.
8. Activities in school or out-of-school which are interesting to pupils.
9. Elimination of those cases of poor work not due to lack of interest.
10. List of interesting activities of home, school, or community related to the course.
11. Teaching methods, materials, and activities for course effective in motivating pupils.
12. Most important difficulties, most interesting activities, most effective methods.
13. Plan of the course and its presentation organized with reference to suggestions for motivation.

[1] The fifteen types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

14. Suggestions for improving tentative plan.
15. Valid and reliable results.

SOURCES	TECHNIQUES											
	Analysis	Reading and Recording	Observation	Personal Interview	Group Conference	Question blank	Check list	Experiment	Testing	Group rating	Individual Evaluation	Sampling
Pupils												
Members of the class			**1,3,5, 8, 10**	**1,3,5,6, 7, 8, 10**		3,5,6,7, 8, 10	3,5,6,7, 8, 10	**14**	**1, 3**	**12**	**1, 2**	**15**
Members of previous classes				5, 6, 7, 8, 10		5, 6, 7, 8, 10	5, 6, 7, 8, 10			12		15
Teachers			**3**,4, 6, 7,8,**11**	1,3,4,6, 7, **8**, 11	3,4, 6, 7,**8**,11	3,4,6,8, 11, **14**	3, **4, 6,** **7**, 8, 11			**12**		15
Supervisors			1,**3,4, 6,7,8, 11, 14**								**12**	
Other authorities on teaching						**4,6,7,8, 11**, 14	4,6,7,8, 11, 14			12		
Subject matter Experts						4, 6, 7, 8, 11	4, 6, 7, 8, 11			12		
Parents			4, 10			4	4					15
Occupational groups			10			10						15
Community members in general			**10**			10						
Professional literature on special methods	**4,5,7, 8, 11**											
on educational psychology	**4,6,7, 8, 11**											
Studies of children's interests	**6,8,11**											
Texts, references, courses of study	**8, 11**											
School supply catalogues	**11**											
Bibliographies	**11**											
Popular literature	10											
Libraries, museums, exhibits, etc			**11**									
School records		1										
Local environment			**10, 11**									

Boldface figures indicate essential steps; others are optional.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES							
	Analysis	Individual Evaluation	Comparison	Summarizing	Classification	Organizing	Frequency Count	Sampling
Mental ability of pupil	....	....	**2**	....	....	....	....	....
Degree to which pupil is attaining course objectives	....	....	**2**	....	....	....	....	....
Pupil difficulties	**4**	**12**	4,6,7, **11**	12	....	....	12	**15**
Causes of pupil difficulty	....	....	.....	....	**9**	....	....	....
Pupils' interests related to the course	**6, 7**	**12**	4,6,7,**11**	....	13	....	....	**15**
Home and community activities related to the course	....	**12**	**11**	12	13	....	....	**15**
Causes of pupil indifference	....	....	.....	....	....	....	....	....
Methods of teaching, lists of materials, and other suggestions for motivation	....	**12**	.....	....	13	**13**	....	**15**
Plan for motivating the course	....	**14**	.....	....	....	....	....	....

Boldface figures indicate essential steps; others are optional.

Specimen Service Studies. — In selecting studies for illustration the attempt has been made to emphasize variations in the type procedure. Since few significant variations were found, the number of specimens shown is comparatively small. The problems also represent differences in scope.

Reading — Elementary Grades

Problem No. 1: To improve the reading ability of six over-age pupils in the first grade by determining the activities that may be used to motivate reading.

Major Assumptions: 1. That the respects in which over-age pupils differ from normal pupils most noticeably in learning to read are suggestive of factors to be utilized in improving methods of teaching reading to over-age pupils.

2. That the *24th Yearbook* of the National Society for the Study of Education together with Gates *The Improvement of Reading* adequately represent the professional literature pertinent to the problem.

3. That differences in the sustained attention of a first-grade pupil to reading activities of different types are due to differences in the interest aroused by the different activities.

4. That children are interested in after-school activities engaged in at home and on the playground.

Procedure: 1. Observe the over-age pupils during the reading period and compare them with the normal pupils, noting all significant differences in their responses to the various activities engaged in.

2. Collect the reading activities appropriate to the first grade as suggested by Gates and by contributors to the *24th Yearbook*.

3. Collect the after-school activities of primary-grade children by observing them and by interviewing parents.

4. Relate the pupils' after-school activities to the reading activities suggested by the literature as a means of developing classroom reading activities that are interesting to over-age pupils.

Comment on Findings: 1. It was found that the over-age pupils were most noticeably deficient in respect to general intelligence and interest.

2. The study of after-school activities showed the over-age pupils to be interested in making toys and

other articles, hence directions for the construction of various articles were printed on cards for instruction in reading.

3. The pupils' interest in games was utilized by printing rules for old and new games that pupils were taught to read.

4. Pupils' interest in recalling experiences in fishing and exploring in the woods was capitalized by making booklets about such experiences to be used as material for instruction in reading.

5. Interest in daily accounts of their own activities was similarly transferred by placing such accounts on a classroom bulletin board.

Literature — Secondary Grades

Problem No. 2: To locate and remove causes for indifference toward English classics on the part of those members of a twelfth-grade English class who do not intend to enter college, approximately one third of the class.

Major Assumptions: 1. That the same course is prescribed for both college and non-college groups.

2. That the prescribed classics are valuable to the non-college group to the degree that the pupils' interest is aroused in the reading.

3. That the pupils' interests can be aroused by eliminating such causes of prejudice and distaste as are extraneous to the literature read and also by applying appropriate incentives.

Procedure: 1. Apply group tests of general intelligence and of reading ability to the class as a whole for evidence regarding the ability of the non-college pupils as compared with the college group. Where abilities to interpret the reading are rendered doubtful by the test results, testimony of other teachers, and personal judgment, either substitute simpler readings for such pupils or greatly simplify the assignments covering the readings prescribed.

2. Interview each of the non-college pupils who are found capable of doing the work but disinclined to make the necessary effort. Ask each pupil for a statement of the reading he most enjoys and for a statement of the features of the course or of the classical literature to which he most strongly objects. Where such data cannot be obtained directly, appoint a few suitable members of the class to collect the desired information from the non-college group — all names being withheld. The preferred types of reading and the objectionable features of the course may then be summarized in separate check lists to obtain ratings from the non-college group.

3. Supplement the list of objectionable features, if possible, by inviting one or more expert teachers of other subjects than English to visit the classroom and criticize the teaching procedure from the standpoint of motivation and with special reference to the non-college group.

4. Obtain from professional books and journals on

the teaching of literature such suggestions regarding methods of presenting and directing study of the classics as apply to the class as a whole.

5. Select as collateral reading for the non-college group such modern works of fiction and extracts from current periodicals as are suggested by the list of preferences obtained, when any such can be found that bear to some extent upon the plot or significant situations in the classical selections. Substitute this collateral reading for any analytical study of the prescribed selections that the college-pupils may be required to make.

6. Adopt any useful suggestions toward removing objectionable features of the course as obtained from the pupils, other teachers, and the professional literature. Describe such changes in the management of the class in writing and submit them to competent critics for correction and additions.

Comment on Findings: 1. The success of the study consisted primarily in the interest developed in the non-college group by shifting the emphasis from the formal aspects of classical literature to the significant life situations contained both in the prescribed classics and in contemporary reading.

2. Interest was also increased by giving greater attention to the method of presenting each new selection to the class and by allowing the pupils to choose from a number of assignments covering each selection.

3. The change in procedure naturally increased the interest of the college group as well.

References: Fries, Hanford, and Steeves, *The Teaching of Literature*, Silver, Burdett; Leonard, S. A., *Essential Principles of Teaching Reading and Literature*, Lippincott; Logasa-McCoy, "Seven Tests for the Appreciation of Literature," Hannah Logasa, University High School, The University of Chicago.

English Composition — Secondary Grades

Problem No. 3: To secure the cooperation of a ninth-grade class in English composition which is composed of boys who have elected the technical curriculum and are primarily concerned with shop work in a four-year high school of a large city.

Major Assumptions: 1. That the needs of the particular class are sufficiently different from the needs of other classes to require adaptation of the course as taught to other classes of the same grade.

2. That the teacher is free to organize and conduct the course in whatever way seems best for the pupils concerned.

3. That the pupils are indifferent to the course as a whole and are not concerned about their serious deficiencies in written and spoken English.

Procedure: 1. Collect as many appropriate suggestions toward the motivation of a desire to use good English as can be obtained from professional literature, correspondence with specialists, and other successful teachers of the pupils concerned.

2. Select from the suggestions those that may be

used by teachers of other subjects to make the pupils wish to improve their use of English. Outline the suggestions clearly and distribute the outline among the other teachers, after a conference in which the suggestions are fully explained. Include only such suggestions as require little or no effort on the teachers' part — such as displaying posters, referring to the importance of good English in securing and holding jobs, etc.

3. Interview the teachers of other subjects, especially shop subjects, to obtain specific situations in which the pupils' use of clear English is important — e.g., spelling machine parts correctly on stock orders, writing clear directions for assistants to follow, describing mechanical processes accurately, and the like.

4. Collect examples of the pupils' most serious errors in spoken and written English and prepare them in the form of exercises to be corrected, utilizing the situations obtained from the other teachers wherever possible. Add interest to each exercise by writing the mistakes in a narrative paragraph or in a paragraph concerning a topic of current appeal.

5. Organize the materials of each type and introduce them by different methods for sake of variety. Supplement the exercises by other materials obtainable from publishers and suggested by the literature on the teaching of composition — such as test exercises to stimulate competition, verbal puzzles to emphasize precise meanings of words, and the like.

Comment on Findings: 1. The study increased the interest of the class largely by the use of a wide variety of easy exercises based on pupils' speech in the classroom and on writing sentences to express novel, humorous, or otherwise striking ideas.

2. The cooperation of the other teachers was perfunctory but did something to improve the pupils' attitude.

Geography — Elementary Grades

Problem No. 4: To identify the activities of immediate interest to the members of a sixth-grade class that may be used to motivate the study of geography.

Major Assumptions: 1. That the prescribed course in geography may be related at many points to the pupils' activities out of school.

2. That the activities of immediate interest to children represent activities in which they engage frequently and voluntarily and which they consider "enjoyable."

3. That children will freely report such activities to the teacher who conducts the investigation.

4. That the teacher concerned is competent to distinguish interesting activities that may properly be used to motivate the study of geography from other interesting activities that should not be so used.

Procedure: 1. Ask the pupils to report each Monday the things they did over the week-end which they found to be most fun. (Monday is the best day for the

reports since the pupils of this class have little free time except on Sunday.)

2. Rank the activities on the basis of scope by computing the number of pupils reporting the same activity.

3. Rank the activities on the basis of frequency by finding the ratio of the number of times it is reported divided by the number of pupils reporting.

4. On the basis of personal judgment select (a) the activities that a knowledge of geography would help one to perform more successfully and (b) the activities that geography helps to explain.

5. For purposes of motivation utilize the activities selected in the preceding step that stand above the middle of both the rank list for scope and the rank list for frequency.

Comment on Findings: 1. While many activities useful for motivation were reported, it was found that the geographical facts related to the activities reported for any one week tended to occur either earlier or later in the course of study as scheduled. This difficulty was met by utilizing only those related to the material for the given week and classifying the other activities under the more appropriate topics to follow. Any activities, otherwise useful, that were considered likely to lose their interest if postponed, were introduced immediately.

2. The activities most pertinent to the geography were those involving geological facts as related to human activities; next in order of frequency were facts

concerning the sources and distribution of raw materials obtained from the vicinity.

American History — Secondary Grades

Problem No. 5: To determine causes for the open hostility of an eighth-grade class in junior high school toward the course in American history as conducted by a previous teacher, and to find means of removing the causes determined.

Major Assumptions: 1. That the basic content prescribed by the course of study is appropriate to the given class and may not be substantially changed.

2. That the same class shows a satisfactory attitude toward other required courses.

3. That the pupils' distaste for the course is largely due to the methods of instruction employed by a previous teacher from whom the class was transferred at the end of the first month of school.

4. That the eighth-grade pupils concerned are able to express their attitudes regarding the various methods of instruction employed by the previous teacher.

Procedure: 1. Having explained away any notion in the pupils' minds that an attempt to criticize previous methods of classroom procedure implies personal criticism of the former teacher, give a group test on the historical information studied since the beginning of the course. Explain further that the purpose of the test is to find out where to begin.

2. Select about five pupils having the lowest scores

on the test, one or two with average scores, and one or two with the highest scores. Interview the pupils individually, asking each to mention the requirements that were most difficult to meet and any other features of the course considered unnecessary or otherwise objectionable. Record each pupils' comments.

3. Ask one or two bright pupils whose attitudes are friendly and who are popular with the class, to talk with other pupils and try to find other impersonal reasons for the general prejudice against the course.

4. Make a list on the board of the more significant features found to be unpopular and have each member of the class list by number the features to which he objects.

5. Reorganize the classroom procedure by substituting other procedures for those found most objectionable. Introduce supplementary materials and interesting learning activities suggested (by personal experience, other teachers, and professional literature) as most likely to develop a cheerful and cooperative attitude in the given class.

Comment on Findings: 1. The study was entirely effective in removing the pupils' previous dislike for the course, largely as a result of the opportunity given to criticize the former procedure from the standpoint of the desired outcomes.

2. Over emphasis upon the memorizing of factual material and upon the construction of maps were reported as the chief causes of dislike.

Arithmetic — Elementary Grades

Problem No. 6: To select procedures whereby a given fourth-grade class may learn fractions with maximum interest.

Major Assumptions: 1. That the class shows a normal degree of interest in other fourth-grade subjects but an aversion to arithmetic in general and to the subject of fractions in particular.

2. That the course of study requires training in the solutions of a number of specific problems involving fractions.

3. That the pupils' aversion to the work consists largely in the necessity of dealing with abstract symbols that are not closely enough related to actual number experiences; also in the monotony of the uniform activities used for drill purposes.

Procedure: 1. Prepare a list of illustrative materials, graphic exercises, learning devices, and concrete life situations involving the use of simple fractions — by consulting monographs on the psychology of arithmetic, literature on the teaching of arithmetic, and other successful teachers of the subject. Classify the types of material and the learning activities by grouping together the items that may be used at the same time in the classroom or used in the same teaching operation.

2. Examine a variety of school textbooks in arithmetic and select life problems involving simple fractions that are considered most likely to interest the given

class because of the situations described in the problem. Collect from other teachers, children's magazines, and other sources a large number of problems in simple fractions that involve the puzzle interest — e.g, how to measure out some exact amount of water by means of two pails of different sizes.

3. Reintroduce the subject of fractions by means of the graphic illustrations and without reference to any rules. Then assign simple exercises involving the manipulation of blocks, segments, and other appropriate materials until pupils have made clear associations between the concrete examples of fractions and the symbols used to denote fractional relationships. Record the names of pupils who take an active interest in the work with concrete materials.

4. Present the problems and exercises in fractions selected as most likely to interest because of the situations described. Allow time for a sufficient number of these to be worked and encourage pupils to discuss the "common sense" of each problem or puzzle. Record as before the pupils who show an active interest in working out a majority of the exercises.

5. Present the problems contained in the course of study and make any necessary explanations in terms of the previous exercises with the concrete materials and the problem situations. While the prescribed problems are being worked, note as before the pupils who appear to be actively interested.

6. On the basis of the records made, select the

specific learning activities found to interest the largest number of pupils. Retain such activities for future use and supplement them by any other appropriate devices for adding interest to the subject of arithmetic in general.

Comment on Findings: 1. The most important consequence of the study was the policy of allowing individual pupils to work with the simpler materials until ready for the work with symbols. Each pupil was assigned the problems prescribed by the course of study only when he had shown a clear understanding of the symbols involved.

2. The most interesting exercises were obtained from the puzzle pages of children's magazines and from a few of the more recent textbooks.

Algebra — Secondary Grades

Problem No. 7: To increase the interest of a ninth-grade class in their study of the formula by finding means of applying formulas to relatively concrete situations.

Major Assumptions: 1. That the pupils have normal intelligence and normal interest in other units of the course but are averse to the study of the formula because of its abstractness.

2. That the pupils have been introduced to algebra in the eighth grade and have also a superficial acquaintance with general science, intuitive geometry, and practical measurements.

Procedure: 1. Consult members of the class concerned, other teachers of the department, professional literature on motivation and on the teaching of junior high-school mathematics, and resourceful teachers of other subjects. From these sources determine the algebraic formulas with which the class is familiar, the physical and mechanical laws with which the class is familiar that are most clearly adapted to algebraic statement and treatment, the specific difficulties met by the class in their study of the unit on formulas as at present constructed, and the illustrative devices useful both in removing the difficulties and in arousing interest in the formula as such.

2. Present the formulas selected as familiar in connection with the laws studied in general science, and give the class practice in formulating the laws algebraically. Introduce any other appropriate motivating devices suggested by the sources consulted, such as having pupils see how many formulas they can make up to express familiar relationships like the relation between the size and height of an apartment in a given building to the rent for the apartment.

3. Reverse the procedure and assign algebraic problems to be solved by means of the formula studied. Test to discover which of the difficulties previously noted have been removed. Proceed with other types of formula in the same way.

4. Interview the pupils who still have serious difficulties and have them attempt problems in which the

difficulties are involved. Analyze the causes for the difficulties and prepare exercises that require concentration on each element of difficulty separately.

Comment on Findings: 1. The general aversion to the unit was removed by the clear understanding of the purpose of the formula as developed by practice in making formulas inductively.

2. The lack of interest resulting from individual causes was found to grow less as the individual's personal difficulties were removed by directed practice with the exercises.

General Science — Secondary Grades

Problem No. 8: To determine reasons for the unwillingness of a ninth-grade class to give proper attention to the work in general science and to find means of securing their active interest in the work.

Major Assumptions: 1. That the given class shows normal interest in other courses required of all ninth-grade pupils.

2. That the prescribed textbook needs to be supplemented by materials whereby the principles studied are related to significant situations in the pupils' experience.

3. That the learning activities assigned need to be modified in whatever way will increase their interest for the class without sacrificing educational values.

Procedure: 1. Give the class a series of standardized tests concerned with various desired outcomes — e.g., knowledge of facts, ability to select the essential idea

in a paragraph of scientific explanation, scientific attitudes, and laboratory skills.[1] Give the class also a standard group intelligence test — e.g., the National, Terman, or Otis. Compare the standing of individual pupils on both types of test and identify the pupils whose rank in intelligence is noticeably above their rank on the general science tests combined. Such pupils may be regarded as problem pupils from the standpoint of motivation.

2. Interview the problem pupils individually to obtain as much specific information as possible regarding (a) the nature of their difficulties in the course, (b) the parts of the course or the classroom activities and requirements they consider unnecessary, (c) their specific interests in the course, if any, and in other courses, and (d) the nature and extent of their contacts at home and elsewhere with situations involving science principles — such as the farm, the summer camp, the automobile, the kitchen, and the literature of popular science.

3. Throw the data obtained from the interviews into a check-list and have each member of the class check the items pertinent to his case. Summarize the returns for convenience in reference.

4. Modify the features of the course considered objectionable by a significant proportion of the class

[1] Select appropriate tests from the general science tests listed and annotated in the *Bibliography of Educational Tests* issued by the Bureau of Educational Research, Indiana University.

by applying any appropriate suggestions obtained from professional literature and other teachers of the given class.

5. Ask each pupil to submit each week as many questions of a scientific nature as are suggested by his experiences out of school during the preceding week or by his leisure reading. Supplement the questions received by others found by experience to stimulate the curiosity of ninth-grade pupils. If the questions thus collected are too few or too closely confined to certain units of the course, write letters to such of the pupils' parents as are known to be interested in the problems and able to help. Invite the parent to pass on from time to time the problems or questions or situations of a scientific nature in which the child is much interested and which are likely to interest his classmates.

6. Organize the data thus obtained in this form of introductory problems for appropriate units, supplementary exercises, individual projects, and situations for use as illustrations.

Comment on Findings: 1. The features of the course found to cause most of the indifference included notebook work, preparation of exercises at the close of each chapter in the textbook, monotony in classroom recitations, and (on the part of girls) discussion of unfamiliar mechanical contrivances.

2. The familiar problem situations obtained from the pupils and from three or four parents who took the request seriously served to give the necessary point and concreteness to the textbook discussions.

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5. Testing and Diagnosis

(Type Problem II D)

Testing is a problem to be investigated with reference to a particular group of pupils, when one eliminates both the specific problems that may be solved off-hand and the more general problems that involve research. The type of problem that is best solved off-hand is illustrated by such questions as when to administer a test, how many tests to administer, and whether to multigraph a test or place it on the blackboard. Questions like these obviously require no investigation in the large majority of cases. On the other hand the field of testing is alive with problems

that require the techniques of research rather than the service study techniques to which this volume is confined. All problems involving the statistical validation of tests, the determination of norms for age and grade groups at large, and the construction of tests to secure data of mainly theoretical value — these and similar problems of equal complexity lie beyond the range of the service study. Within this middle ground, bounded by the teacher's judgment on the one hand and by the research investigation on the other, the service study has ample scope.

Problems. — Thus restricted, the problems responsive to the service study approach are of three major types; namely, problems involving the selection of standard tests, problems involving the construction of tests for specific teaching conditions, and problems involving the interpretation of test results. The implications of each type of problem may be suggested by the following outline:

ANALYSIS OF TESTING

SERVICE PROBLEMS	TYPES OF TEST	LEARNING PRODUCT	PURPOSES[1]
To select standard tests To construct tests To interpret test results	Pre-test Test exercises Unit or Final Tests	Knowledge Abilities Attitudes etc.	To select pupils To evaluate methods To define difficulties To motivate To emphasize objectives, etc.

[1] Cf. the relatively complete list of purposes for which measurements are used as presented by P. M. Symonds, *Measurement in Secondary Education*, p. 1 f.

The outline is intended to suggest that each of the three types of service problems may involve any one of the three types of test, as applied to any type of learning product, and as used for any one of various purposes. The procedures useful in conducting the service study are more largely influenced by the nature of the problem than by any of the three other elements indicated.

When standard tests are selected off-hand by the teacher or supervisor, the problem is either evaded or the number of tests is so small that the problem does not require investigation. Where a large number of tests is available — as in most elementary subjects and in a few secondary subjects — there are many factors to be considered. These factors are, of course, very similar to the factors to be considered in constructing a test. Assuming that the teacher knows what the factors are, it is usually possible to make a tentative selection merely by a careful examination of the tests with reference to the work of the class and by reading to discover how the test has been constructed.

The investigation necessary in connection with the selection of tests is thus largely confined to experiment with the tests selected in order to decide how safely they may be used to measure attainment of the specific outcomes that are most important for the particular class. The outcomes most readily tested are usually the outcomes most easily produced, consisting primarily in the knowledge of specific facts. Tests that directly

measure only such outcomes need to be tried out to discover how far their scores may also indicate the attainment of other outcomes, such as ability to grasp the larger concepts, ability to apply the facts to life situations, and desirable attitudes resulting from the course. To estimate the attainments of such other outcomes, the standard test needs to be supplemented usually by controlled observation of pupils at work and by other tests of the teacher's own construction. The major difficulty in selecting tests is to find tests that apply closely enough to the actual subject matter studied by the class and to the particular outcomes of major importance.

In selecting tests by observation the following list of criteria proposed by Ruch and Stoddard is helpful. The list will also be useful for reference in connection with service studies in the construction of tests for particular purposes.[1]

CRITERIA FOR SELECTING TESTS

I. Validation
   A. Curricular
      1. Does the test parallel good teaching practice?
      2. How has the social utility of the test content been guaranteed?
      3. Does the test provide an adequate sampling of the important topics or divisions of the subject?
   B. Statistical

[1] G. M. Ruch and G. D. Stoddard, *Tests and Measurements in High-School Instruction*, pp. 45-8. World Book Company, 1927. Quoted by permission.

1. What correlations against outside criteria have been computed?
2. Have the test items individually been submitted to experimental tryouts in order to determine:
   a. That no large percentage of the items are failed by all pupils?
   b. That no large percentage of the items are answered correctly by all pupils?
   c. That the items show consistent increase in the percentage of successes with successive age or grade levels?

II. Reliability
1. Has the reliability of the test been established experimentally for some standard group such as an unselected grade, age, or subject group?
2. How were the reliability coefficients obtained?
3. Are the measures of reliability expressed in some stable form (e.g., the probable error of a score) which is more or less independent of the range of talent used?
4. Is the test reliable enough for individual measurement, or should it be confined to the measurement of groups like classes, schools, or school systems?

III. Ease of Administration
1. How complete and simple is the Manual of Directions or Examiner's Guide?
2. Are the test conditions well controlled by the instructions given in the Manual?
3. Are the directions to the pupils clear, detailed, and comprehensive?
4. Are samples and "fore-exercises" supplied where needed?

IV. Objectivity of Scoring
1. Do the authors provide convenient scoring keys and stencils?
2. Are adequate directions given for scoring and computing scores?
3. Is the test purely objective, or do the scorers have to exercise judgment in accepting pupils' responses?
4. About how many tests can be scored per hour?

V. Interpretation of Results: Norms
1. What kinds of norms are provided?
2. Are the norms based upon the performances of a large number of pupils, or are they derived arbitrarily?
3. Is the interpretation of the pupils' raw scores simple and direct?

VI. Diagnostic Value of the Test
1. Is the test a general or "survey" test, or is it genuinely diagnostic?
2. If a diagnostic test, what principle or principles underlie the construction of the test?
3. How many different functions (skills, abilities, or aspects of the subject) are separately analyzed and measured?
4. Does the analysis of the total subject into unit abilities follow teaching practices and teaching needs?
5. Is the diagnosis individual or class diagnosis?
6. Does the test demand tabulation of individual pupils' errors in order to secure a diagnosis?
7. Is a remedial or corrective program based on the results of the testing provided (or suggested) through the Manual, or otherwise?

VII. Number and Equivalence of Duplicate Forms
   1. How many equivalent forms of the test are provided?
   2. Are the various forms equivalent? *i.e.*,
      a. Do they have the same average difficulty?
      b. Do they show the same range and variability of scores for the same group of pupils?
      c. Do they represent homogeneous and non-duplicative samplings of the same function (ability or subject)?

VIII. Time Requirements, Cost, Mechanical Features, etc.
   1. Is the time required for giving the test as small as is consistent with reliable measurement?
   2. Are the tests attractively printed and interesting in appearance?
   3. Are the test blanks free from distractions by way of norms, directions to the teacher, etc.?
   4. Is the paper of good quality?
   5. Is the cost in keeping with the amount, scope, and reliability of the results yielded?

The *construction* of tests for a given class at a given time involves a compromise between the test that is a reliable index of the degree to which the pupils have attained a certain desired outcome and the test that embodies activities useful in attaining the outcomes. In other words the test must have sufficient scope to measure the attainments reliably. The test must also relate closely to the actual work of the class. A test of general intelligence meets the first requirement but fails to meet the second and hence has very limited

use as a method of instruction. A test of pupils' ability to write a synopsis of the French verb *falloir*, meets the second requirement but fails to meet the first. While such a test deals directly with the actual work of the class, the scores might well bear no relation to the pupils' attainment of the desired outcomes of the course as a whole; that is, a pupil might easily be able to write a synopsis of the verb correctly and yet fail to realize the values of the course as a whole.

This suggests that teachers in constructing their own tests should make certain that a positive relationship exists between the scores made on the test and the attainment of desired outcomes. By describing such procedures Symonds affords direct help in the selection, construction, and interpretation of most types of tests that teachers of any grade have occasion to use. With reference to the relative importance of standardized versus informal tests, Symonds remarks as follows:[1]

> The new type tests described in Chapter III, besides serving as a form for standardized tests, may also be used in the construction of informal tests by the teacher. It will be long before standardized tests have been prepared for high-school subjects so that the teacher can wholly dispense with tests of her own construction. It is the hope that this may be realized eventually to a large degree. The thread of argument of this book leads to the conclusion that sound measurement in the secondary school cannot be accomplished except through the agency of standardized tests. But in two senses standardized tests ought never wholly to

[1] P. M. Symonds, *op. cit.* p. 531 f. The Macmillan Company. 1927.

replace the informal tests of the teacher's construction. In the first place no course in the high school ought to become so standardized and fixed and motionless that it can be caught and photographed by a standardized test. The high-school curriculum ought always to be in a state of readjustment to keep up with the changing times, although this change need not be so rapid as now. Once the reorganization of the secondary curriculum is effected, it will not be permitted to become static again. For this reason standardized tests can never wholly take the place of informal tests. From another point of view it would be fatal for teaching and for the teacher to expect such a uniform curriculum that standardized tests could be used exclusively. The resourceful teacher requires some latitude in choosing material for the course, in shaping the course around local or personal interests, and in meeting the exigencies of local and contemporary events. Good teaching must strike when the iron is hot and this would not be possible with a rigid curriculum. There is no better way of making teaching artificial and mechanical than to sharply define the course by examinations prepared from without.

The obvious implication here is that teachers must standardize tests of their own construction with reference to the particular outcomes desired and with reference to the given school community — whenever no standard tests are available for use in measuring the particular outcomes of major importance.

The problems involved in the *interpretation* of test scores are essentially technical problems; that is to say, the problems arise in connection with the use of tests as techniques for the collection, organization, and

interpretation of data. In Chapter VI of the present volume the test is discussed as one of the various techniques listed in Chapter II. Generally speaking, some form of test is necessary to obtain reliable information concerning pupils' personal experiences both in school and out. To what extent one can place confidence upon the test results in evaulating such experience depends of course upon the other data available as a check. It is thus usually necessary to approximate the statistical device of correlation in the attempt to find out how closely two or more types of data correspond. Problems of interpreting test results accordingly consist in the collection of additional data from different sources and in organizing the data so that discrepancies become evident.

Assumptions. — The assumptions necessary to the investigation of problems in testing are dependent upon the objectives and prescribed subject matter of the course, upon the extent of the teacher's acquaintance with individual students, upon the published tests available, upon the pupils' maturity, upon the teacher's skill in preparing test situations, and upon the specific purpose for which the test is used. In the construction of a properly standardized test it is seldom necessary to assume more than that the objectives and the prescribed subject matter are valid. Occasionally even these assumptions are removed by experiment, as in the case of spelling tests based upon word lists that are known to be valid for pupils of the groups tested.

Most standardized tests are based upon reliable facts regarding the other conditions mentioned above. The service study, however, must cover by assumption the conditions that determine the adequacy of the test when such conditions can not be studied experimentally in the time nor with the facilities available.

The follwing list presents the assumptions of major importance that are usually necessary in the *selection*, *construction*, and *interpretation* of tests by means of service study procedures.

1. It is assumed that the objectives of the course are valid for the given class and that the objectives have been analyzed to the specific outcomes desired.

2. It is assumed that subject matter has been collected and organized for use in attaining the outcomes desired and that the subject matter so organized is appropriate for the given class.

3. It is assumed that for certain elementary and secondary courses of study it is possible to secure published standardized tests and that the scores on such tests correspond with a true measure of the pupils' attainment of one or more of the desired outcomes specified for the given course or subject.

4. It is assumed that the teacher or supervisor concerned is competent to select standard tests appropriate to a given class on the basis of criteria presented in available professional literature.

5. It is assumed that the tests constructed by the teachers concerned are intended either to estimate the

attainment of desired outcomes not adequately measured by standard tests, to stimulate the attainment of such outcomes, or to obtain data concerning individual pupils which are not so reliably obtained by other means.

6. It is assumed that the results of self-constructed tests are useful for the three purposes mentioned, even though no evidence is obtained regarding the correspondence between the results of various other tests applied to the same class or to different classes.

7. It is assumed that in the interpretation of test scores the teacher is competent to judge wisely in the face of conflicting evidence, pending such further investigation as is necessary to establish the facts.

Type Procedure. — The procedures used for the investigation of problems in testing depend both upon the specific problems themselves and upon the particular purpose for which the tests are to be used. The following type-procedures are consequently more abstract than the type-procedures of other type-problems.

The Problem. To select or construct tests useful in obtaining helpful information regarding the individual members of a class when the information desired can not be so readily obtained by more direct methods; also to interpret test scores as they apply to problems in teaching method.

Abstract of Procedure. 1. List the outcomes desired for the course as a whole and for the particular unit

or units of subject matter to be tested. (See Specimen Studies, No. 1, Step 1; No. 1, Step 2; No. 3, Step 1; No. 4, Step 2; No. 5, Step 1; No. 9, Step 1.)

2. Obtain from test bibliographies, textbooks on testing, special methods texts, supervisors, or other teachers — suggestions regarding the available tests that may be used to measure one or more of the desired outcomes in terms of the given subject matter. Where several such tests are available, base the selection upon their validity and reliability as determined by experts; also upon the directness with which the tests bear upon the particular outcomes desired. (See Specimen Studies, No. 4, Steps 1, 2, 3, 4; No. 5, Step 2; No. 9, Step 2.)

3. Determine, from available authorities and from professional literature, to what extent the remaining outcomes can be tested by written group tests and what forms of test are most effective as applied to each type of outcome. Draft tentative forms of written group tests for each type of outcome to which such tests are found to be appropriate. (See Specimen Studies, No. 1, Step 2; No. 2, Steps 3, 4, 5; No. 9, Step 3.)

4. Determine (by observation, pupil-interviews, and analysis of the subject matter and desired outcomes) what pupil-responses represent attainments or non-attainment of the outcomes that can not be properly measured by written group tests, considering each outcome separately. Note the directions, questions, or

facts that may serve to produce such responses. Consult all available sources for suggestions regarding test devices applicable to outcomes of this type. (See Specimen Studies, No. 2, Step 3; No. 3, Step 1; No. 5, Step 1; No. 6, Step 1; No. 9, Step 4.)

5. In the light of suggestions obtained, draft tentative test procedures considered useful in estimating the attainment of this type of outcome — like attitudes, personal traits, and others not capable of measurement by written group tests. Submit the tests to competent critics for improvement; then try them out and revise. Seek remedial measures for deficiencies revealed by the tests. (See Specimen Studies, No. 1, Steps 3, 5; No. 3, Steps 4, 5, 6; No. 3, Steps 2, 3, 4; No. 5, Steps 2, 3; No. 6, Step 1; No. 8, Steps 1, 2, 3, 4; No. 9, Steps 4, 5.)

5a. (Optional.) Where any of the self-constructed written group tests differ from some published standardized test merely in that they are restricted to a smaller unit of subject matter, compare the tests in respect to length, organization, form of directions, methods of scoring, and difficulty. Incorporate any useful features suggested by the comparison. In such cases it is well also to give both the self-constructed and the standardized test to the pupils of the given class and correlate the scores for what inferences may be drawn regarding matters of form, degree of difficulty, and other comparable features. (See Specimen Studies, No. 6, Steps 2, 3; No. 9, Step 5.)

5b. (Optional.) To improve the self-constructed

group tests, tabulate the scores of each pupil for each item of the test separately; then compare the scores to determine items that are too easy or too difficult, items that may be omitted because of their dependence upon or identity with other items, and new items to be added to normalize the distribution. (See Specimen Studies, No. 1, Steps 4, 5; No. 7, Steps 1, 2, 3, 4, 5.)

5c. (Optional.) Rank the pupils according to scores on the tests constructed for each type of outcome desired and estimate the validity of the ranks. Base such estimates upon previous knowledge of the pupils and any other available criteria of the extent to which each outcome has been attained by the given pupils — such as other teachers' estimates, home interests and experiences, classroom responses, records of interviews, and the like. Make whatever modifications of the test are suggested by such comparisons. (See Specimen Studies, No. 2, Step 6; No. 5, Step 4; No. 6, Steps 2, 3; No. 9, Step 5.)

Type Study. — *Problem.* To select and construct tests which are useful in obtaining information about a sixth-grade class in arithmetic, also to interpret the test results in so far as they may serve to indicate appropriate methods of teaching.

Assumptions. 1. That the objectives for sixth-grade arithmetic have been defined in terms of computation abilities, life situations to which arithmetic may be applied, and traits of personality required for success-

ful work in arithmetic, both in school and out of school.

2. That published tests are available which measure the computation skills for sixth-grade pupils.

3. That the degree to which essential traits are present in sixth-grade pupils may be reliably determined by teachers' observations and ratings.

Procedure. (See the foregoing Abstract of Procedure for complete list of steps.)

Step 1

"List the desired outcomes of the unit or course."

The objectives which had been previously defined for the course in sixth-grade arithmetic were:

a. Computation — Ability to add, subtract, multiply and divide all combinations of positive integers from 1 to 10,000 in which the results are positive numbers. Ability to add. subtract, multiply and divide all combinations of positive common fractions with the following denominators, or mixed numbers under 10,000 which involve these common fractions and in which the results are positive: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 20, 24, 25, 30, 32, 50, 64, 75, 100. Ability to add, subtract, multiply and divide all one to four place positive decimal fractions under 10,000 in which the results are positive.

b. Life situations — A representative list of fifty-two type situations met in domestic and com-

merical activities had been collected, including such items as the following:

1. Selling of cotton and other farm produce.
2. Buying of groceries (involving denominate numbers).
3. Keeping a budget, etc.

c. Traits — the application of the following traits to arithmetic problems:

1. Persistence.
2. Initiative.
3. Speed.
4. Industry.

Step 2

"Selecting good printed tests available which apply to the given course or unit."

Test bibliographies prepared by the Bureau of Educational Research of the University of North Carolina and of Indiana University were consulted, as well as the lists of tests published by the World Book Co., and the Public School Publishing Co. A list was prepared of those available tests which were related to the Computation Objectives. On the advice of the county supervisor and the state university Bureau of Research, the Schorling-Clark-Potter *Instructional Tests in Arithmetic* (World Book Co., 1928), were selected. These tests were used to measure the extent to which pupils had mastered the skills of computation involved in the course.

Step 3

"Determine to what extent the remaining outcomes may be tested by the written group tests."

Life situations might be tested by group tests but for purposes of more careful diagnosis the written group test was not selected for this type of outcome. Neither could the personal traits be effectively measured by group tests.

Step 4

"Determine what pupil-responses may be used to measure the remaining outcomes."

To measure pupils' abilities in applying the rules of arithmetic to life situations, the pupils' responses to personal interviews were selected as the most useful criterion. The procedure consisted in selecting ten pupils to represent each of five different ability groups in the class, then in asking each pupil individually to name the arithmetical operations required to obtain a desired result in each of the fifty-two type situations. A record was kept of the number of interviews, *i. e.*, exposures of the entire list of fifty-two situations, that were needed by each pupil in order to name the correct operations. A close correspondence was found between the pupils' standing on the group tests and the number of interviews required to interpret the situation correctly. The pupils most successful on the tests in general required the fewest interviews. However, three of the ten pupils were clearly more success-

ful in the tests than in the interviews. Study of these pupils led to the conclusion that although they could apply rules mechanically to purely numerical problems, they did not understand the commonsense applications of these rules.

To measure the essential traits, pupils were selected who were deficient in the work of the course to date but who were above the class median in respect to skills of computation and ability to interpret the life situations. These pupils were rated by their three teachers on a five point scale in respect to each of the four traits selected as essential; namely, persistence, initiative, speed, and industry.

Step 5

"Try out the tests and seek remedial measures for deficiencies revealed by the tests."

In diagnosing pupils' difficulties in computation the Schorling-Clark-Potter tests were given. A record card was prepared for each pupil upon which his errors were entered. The class errors were then tabulated. Those errors which were common to a large majority of the class were listed as difficulties to be overcome by class instruction. Some twenty-seven such class difficulties were revealed. Errors made by a small number of pupils represented difficulties to be overcome by individual practice exercises. The number of errors made by any one pupil ranged from two to seventy-

nine. Pupils who made large numbers of errors were given extra practice periods during the day, when the schedule permitted.

The most common class errors in the addition of integers involved carrying, when the number to be carried was more than 1. The most common class errors in subtraction were those involving subtraction from 0. In multiplication, examples involving multiplication of 7 or of 9 caused most errors. In division, a dividend containing 0 produced most errors. In common fractions, changing to a common denominator proved highly difficult, whereas in decimal fractions, the placing of the decimal point in multiplication was most commonly in error.

In providing remedial measures in computation, mimeographed direction sheets in connection with a wide variety of practice problems proved most helpful in overcoming difficulties involving the principles of computation. On the other hand, the game of arithmetic solitaire proved helpful in fixing combinations. In this game each pupil has a pack of cards. On one side of each card is one of the number combinations with which he has difficulty. On the other side is the correct answer. The pupil plays the game by laying down the cards one at a time, giving the answer for the combination. He verifies the answer from the back of the card. The object of the game is to give correctly every combination with which he has had difficulty.

Remedial methods applied to deficiencies in the other objectives were closely similar. Pupils suspected of having a purely mechanical command of the principles taught were drilled on a wide variety of exercises similar to those used in the interviews. The pupils were confronted with a series of problems involving arithmetical reasoning and covering a wide range of situations met in the home and in simple business transactions. The teachers attempted to dramatize enough of the situations to challenge the pupils' commonsense in selecting the most efficient method of solving the problems of each type.

Remedial methods for deficiencies in personal traits consisted for the most part in providing as many situations as possible in which an expression of the desired trait would be called for. Pupils lacking in initiative, for example, were given various ways of obtaining help other than by appealing to the teacher. Improvement was found to result in nearly all cases when the pupil was drilled in concrete activities involving the trait, e.g., persistence, rather than being scolded for giving up too easily.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

1. Specific objectives for the course and units of the course.

[1] The sixteen types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

2. Types of activities, or test items, representing attainment or non-attainment of each objective.

3. List of tests already available, useful for measuring attainment of certain objectives.

4. Selection of such published tests are needed.

SOURCES	TECHNIQUES													
	Analysis	Observation	Personal Interview	Group Conference	Dairy	Question blank	Check list	Class Assignment	Experiment	Testing	Group rating	Individual Evaluation	Comparison	Sampling
Pupils in the class		**7**	**7**		7	**7**	7	**7**	**13**	**9**				
Pupils in previous classes			7		7	7	7							16
Teachers			**1,2,5,** 7	1, 2, 5, 7		1, 2, 5, 7	1, 2, 5, 7				**9, 10**			16
Supervisors			**1,2,5, 6, 7**			1, 2, 5	1, 2, 5					**9,10, 16**		
Other authorities on teaching						**1,2,5, 6, 7**	1,2,5, 7				16			
Subject matter, experts						**1,2,5,** 6, 7	1,2,5, 7				16			
Parents			7			7	7							16
Community members			7			7	7							16
Bureau of tests and measurements						2, **3**								
Professional literature on special methods	1, **2**, 3, 5, **7**, 6													
on testing	**2,3**,5,**6**													
Bibliographies of tests	**3**													
Tests, syllabi, courses of study	**1,2**,3,7													
Published tests	**2**, 6											**3**		
Unpublished tests used by others	**2**, 6, 7											**3**		
School records													**12**	16
Community environment		**7**												

Boldface figures indicate essential steps; others are optional.

5. List of objectives not adequately measured by available tests.

6. List of criteria applicable to tests.

7. Specific activities which are indicative of the attainment or non-attainment of each objective.

8. Organization of the specific test activities, record form, plan of administration into a tentative test.

9. Time required for each test element.

10. Difficulty of the test items.

11. An appropriate method of scoring the test.

12. Estimates of validity and reliability of test.

13. Suggestions for improving test.

14. Standards of attainment for each element.

15. Valid and reliable results.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES								
	Analysis	Individual Evaluation	Comparison	Tabulation	Classification	Organizing	Test scoring	Sampling	Correlation
Specific objectives for course and units of course	**2**	....	**4, 5**	....	....	....	....	....	....
Tests already available useful for measuring attainment of certain specific objectives	....	**4, 5**	**4, 5**	....	....	....	....	....	....
Objectives not adequately measured by available tests	**7**	....	....	....	....	....	....	....	....
Lists of criteria applicable to tests	....	....	**4, 5**	....	....	....	....	....	....
Specific activities indicative of attainment of objectives	....	**9,10, 16**	....	....	**8**	**8**	....	**16**	....
Time required for each test element	....	....	....	....	....	....	**11**	....	....
Test results	....	....	**12**	**9, 10**	....	....	**11**	**12**	**12**
Difficulty of test items	....	....	....	....	....	....	**11**	....	....
Teacher estimates of pupil attainments	....	....	**12**	....	....	....	....	....	**12**
Results of a second test similar in nature	....	....	**12**	....	....	....	....	....	**12**
Results of test applied to mature group	**14**	....	....	**14**	....	....	....	....	....

Boldface figures indicate essential steps; others are optional.

16. Selection of specific activities which are best indicators of attainment or non-attainment of each objective.

Specimen Service Studies. — The studies chosen to illustrate the foregoing procedure are mainly concerned with the *construction* of tests, since problems in test *selection* are more adequately treated in the bibliography and problems in the *interpretation* of test data are treated in Chapter VI. Furthermore, since the studies in test construction involve many of the procedures proposed for problems in defining objectives, constructing exercises, and motivating, the reader will do well to consult also the specimen studies shown in the sections devoted to these three type-problems.

Reading — Elementary Grades

Problem No. 1: To construct tests to measure pupils' ability to do work-type reading in the fifth grade.

Major Assumptions: 1. That the objectives of silent reading in the fifth grade are defined in terms of the kinds of material to be read and the abilities to be developed—such as: reading history texts to organize and outline what is read, the ability to select the main ideas, the ability to evaluate what is read, the ability to answer questions upon the content, the ability to use what is read in one's own thinking, et al.

2. That the teacher is competent to formulate exercises by means of which pupils may obtain the sort of practice necessary to develop the desired abilities.

Procedure: 1. Select several examples of each of the kinds of reading material proposed in the objectives. For each kind of material select at least one example considered to be very easy reading, one considered very difficult, and one or two of average difficulty.

2. For each example, prepare several exercises to be performed by the children which require use of the first ability listed in the objectives for that kind of reading material. Then, prepare several exercises requiring the second ability, and so on through the list. Mimeograph the exercises.

3. Arrange with other fifth-grade teachers in the vicinity to give the exercises to their pupils, having each pupil report the amount of time spent on each exercise.

4. Check the exercises, preparing record sheets to show the time spent on each exercise by each pupil who successfully completed it, and showing the number of pupils who failed on each exercise.

5. Eliminate from the test the exercises successfully completed by every pupil and those which no pupil successfully completed.

6. Keep a record showing which objective is being tested by each exercise. For diagnostic purposes refer to this record in determining what further training is needed by each pupil.

Comment on Findings: 1. The test proved a better means of specific diagnosis than any standard test heretofore used.

2. In testing the reading of textbooks it was found most helpful to use selections from texts actually used in the 5th, 6th, and 7th grades.

Literature — Secondary Grades

Problem No. 2: To construct a test of pupils' ability to interpret in terms of life situations the classical selections taught in a ninth-grade course, including selections based upon Greek and Roman mythology, a collection of narrative poems, and two nineteenth-century novels.

Major Assumptions: 1. That the course is so taught that pupils are able to recognize the more important relationships between the situations described in the reading and the situations met in personal experience.

2. That ability to recognize such relationships is an important objective of the course.

3. That pupils' experiences have situations in common that may be appropriately used to interpret the important situations in the literature.

Procedure: 1. Analyze each selection prescribed for the course into its significant elements and prepare a somewhat extensive list of types related to each element; for example, types of plot, types of character, types of national or racial characteristics, types of conduct, and types of emotion portrayed in each of the books or poems read.

2. With the aid of other teachers and of critical literature, where necessary, select the types of each

element that are considered most important both for a correct appreciation of the classic and also for the pupils' better understanding of the significant problems of personal and social life.

3. List situations, events, or problems of every-day experience that represent the type elements selected and that are familiar to the pupil either through his own experience or through his voluntary reading.

4. Prepare a series of problems based upon the familiar life situations, which the pupils are to analyze and explain on the basis of the prescribed reading in classical literature.

5. Follow each problem by such directions as are needed to restrict the pupils' thinking to the specific points involved in each problem and to insure a uniform method of attacking the problem.

6. Apply the tests so constructed to the given class. Estimate the validity of the test by comparing the scores for each pupil with his rank order in the class when the pupils are ranked according to their comprehension of the classics as shown by class discussion, written reports, and incidental responses.

Comment on Findings: 1. The test as developed was useful both as a test and later as a teaching exercise when the pupils' papers were compared and discussed.

2. Since the situations were mainly local in character, the following quotation gives a clearer idea of the type

of test in which the life situations are chosen for classes in general.

Pilgrim's Progress is an allegory. In it different situations that arise represent certain experiences that people go through. Bunyan had in mind for the most part religious experiences, but this allegory can represent many experiences that are not particularly religious in their nature. Here are four parts of *Pilgrim's Progress* numbered from 1 to 4:

1. The Slough of Despond.
2. The Chained Lions.
3. Vanity Fair.
4. Doubting Castle.

Here are six incidents in everyday life, with a blank space in front of each. Four of these can be taken as illustrations of the four parts of *Pilgrim's Progress* just mentioned. Each one of these four incidents illustrates one and only one of the four parts listed. The other two incidents do not illustrate any of the four. In the blank space in front of the incidents put the number of the part of *Pilgrim's Progress* which you think it illustrates.

.....A rather dull pupil has by hard work raised her grade from a low D to a high C.

.....A man in the University of Iowa has a book three-fourths finished, but has done no work on it for a year because he had decided that it is not worth completing, although all of his friends have assured him that it is excellent.

.....A girl in the University of Iowa who could easily win the highest honors in scholarship is getting Incompletes and Conditions because of the time taken up by social life.

.....A boy who might make a real athletic success has decided not to try because there is one part of the work which has "got his goat."

.....A pupil who is not especially brilliant has won the liking and respect of his teachers and fellow pupils by his good manners and his cheerful ways.

.....A pupil who has neglected his work for the first half of the semester is in doubt whether it is worth while for him to try since the neglected work will handicap him.[1]

Spelling — Elementary Grades

Problem No. 3: To test spelling ability in the fifth grade when pupils' attention is primarily directed to the context being written.

Major Assumptions: 1. That the great majority of spelling tests direct the pupil's attention to spelling whereas spelling ability must ordinarily function below the level of conscious attention.

2. That the desired form of test is best constructed with reference to the needs of the given class.

Procedure: 1. Go through the spelling list for the grade and in connection with each word indicate a paragraph topic which you think would be likely to suggest the use of the word to pupils.

2. Give the spelling list to the pupils and ask them to indicate the idea first suggested by each word.

[1] By M. F. Carpenter, University High School, Iowa City; quoted by G. M. Ruch in his book, *The Improvement of the Written Examination* (Scott, Foresman, Chicago, 1925), pp. 82 ff. Quoted by permission.

Then develop additional paragraph topics to cover the ideas.

3. Give the topics to the class at different times, asking them to write an appropriate paragraph on each topic, but do not call the exercise a "spelling test."

4. Select for use as a spelling test the topics which in a large majority of the cases caused the pupils to use the words of the spelling list.

Comment on Findings: 1. The test was useful not only in testing ability to spell the words in context but also as a more convenient method of selecting the words from the prescribed list that most need to be taught.

2. The method of having pupils write down the ideas suggested by each word proved highly successful and saved time in finding topics that involved use of the word.

Composition — Secondary Grades

Problem No. 4: To select from the available standardized composition tests the one or more tests that apply most directly to the desired outcomes of a given tenth-grade course.

Major Assumptions: 1. That published tests can be found in which the objectives of the given course are emphasized.

2. That the objectives of a composition course should be determined with reference to the defects in the written English of the given class.

3. That the objectives of the given course have been determined on this basis.

Procedure: 1. Obtain from an inclusive, annotated bibliography of standard tests (such as the bibliography published by Indiana University) a list of composition tests designed for pupils of the given grade. Obtain samples of each test from the publishers.

2. Analyze the specific types of composition errors suggested by each exercise in each test. Check the totals for each type of error for each test against the list of errors representing the objectives of the course as previously determined. Rank the tests in the order representing correspondence between the errors and the objectives.

3. Examine the literature describing the validity, realiability, time to give and score, and special uses of each test. Rank the tests in the order determined by such criteria.

4. Select for use the test or tests which cover the objectives and which stand highest in the rank determined by the other criteria applied.

Comment on Findings: 1. The two tests selected were the Pressey Diagnostic Tests in English Composition and the Iowa Placement Examinations.

2. The tests were applied at the beginning and at the end of the course to indicate progress. Supplementary exercises, patterned somewhat according to the Iowa Placement Examination, were used as teaching exercises.

Civics — Secondary Grades

Problem No. 5: To obtain tests that may be used to measure or estimate the pupils' understanding of principles, attitudes, abilities in problem solving, and skills — as the desired outcomes of each unit of a ninth-grade course in social science.

Major Assumptions: 1. That the four types of desired outcomes are sufficiently discreet to justify the attempt to measure each one separately.

2. That standard tests are not available for the testing of each type of outcome in terms of the subject matter used to develop each type of outcome in the given course.

Procedure: 1. Taking each type of outcome separately, decide by what sort of pupil-activity it is best expressed. For example, if the unit on "Immigration" is intended to develop a favorable attitude toward recent immigrants who are ignorant of American ideals and customs, then the development of that attitude is expressed by the pupils' conduct toward such immigrants, either directly or indirectly.

2. Collect from reliable test bibliographies the tests in other subjects that require pupil responses most nearly resembling the activities considered to express the type of outcome desired. Examine such tests for suggestions regarding the forms and directions most likely to produce the desired responses.

3. Tentatively prepare tests in which the forms and directions considered appropriate are applied to the

activities in which the desired outcomes are implied. Give the tests to the class and revise the activities found confusing or unrelated in the pupils' minds to the desired outcomes.

4. Develop tests to measure each of the other desired outcomes in the same way. Give each of the four tests, as revised, to the same class on successive days. Rank the pupils according to their scores on each test separately, then correlate each pair of ranks to determine how nearly the tests measure the same learning products or how inter-dependent the four desired outcomes are.

Comment on Findings: 1. The most significant value of the test consisted in the emphasis given to each of the four objectives with references to each unit of the course.

2. The tests for understanding of principles and for ability to solve problems were found considerably more reliable than the tests for attitudes and for skills.

3. The following forms were chosen for the four tests, respectively; for understanding of principles — the principles were stated and the pupils were asked to write brief essays in which the given principle was applied to a specified situation; for problem solving — a best answer test based on a paragraph presenting a social problem; for attitudes — a social situation for which the pupil was asked to describe a desirable mode of conduct according to a topical outline; for skills — a series of directions in the use of printed materials for

the pupil to follow — as in selecting important ideas, finding misstatements of fact, and the like.

American History — Secondary Grades

Problem No. 6: To interpret the scores of a given tenth-grade class on five published tests in American history with a view to determining the extent to which a knowledge of historical facts implies the ability to define social needs and responsibilities in contemporary civilization.

Major Assumptions: 1. That no tests have been published that are valid measures of pupils' ability to define social needs.

2. That this ability represents a highly important objective in the teaching of American history.

3. That this ability corresponds *in some degrees* with the amount of historical information possessed by a given class.

Procedure: 1. Collect clippings from various weekly reviews that describe political, industrial, moral and other social conditions which are clearly undesirable in American society. Submit the list of these conditions to the class and ask each pupil to check the conditions he knows something about. Select the conditions familiar to all pupils and ask each to write a statement of the causes of the situation and a plan for improving the situation. Grade the papers on the basis of the judgments of experts in political science and rank the pupils accordingly.

2. Apply the five tests selected to test the pupils' command of historical information. Rank the class separately on the basis of scores on each test.[1]

3. Correlate the ranks for ability to define social needs with the ranks based on each of the five tests. Note the indices of reliability claimed by the authors of the standardized tests and, making due allowance for low indices, select the test which shows the highest coefficient of correlation.

Comment on Findings: 1. The coefficients of correlation were uniformly low, about half of the pupils maintaining the same ranks in the fact tests and the ability tests while the remainder were high in the one and low in the other.

2. No one of the fact tests could therefore be selected as yielding scores that might be reliably interpreted as an index of the extent to which the ability to define social needs was developed.

Arithmetic — Elementary Grades

Problem No. 7: To determine the relative difficulty of problems in arithmetic to be used in testing arithmetic ability in the fourth grade.

Major Assumptions: 1. That the problems have already been chosen on the basis of the objectives for the grade.

[1] The five tests used were the Barr Diagnostic Tests in American History, the Gregory Tests in American History, the Kepner Background Test in Social Sciences, the Pressey-Richards American History Test, and the Van Wagenen History Scales.

2. That relative difficulty is adequately measured by the proportion of pupils failing to solve a problem correctly.

3. That the distribution of the problems with reference to difficulty is a normal distribution.

Procedure: 1. Arrange with several other fourth-grade teachers to test their pupils' ability to solve the selected list of problems.

2. After the tests have been given, check the papers and indicate the problems not correctly solved.

3. Prepare a record sheet showing the number of pupils attempting each problem and the number failing to solve it.

4. For each problem calculate the proportion of pupils failing to solve it by dividing the number of pupils failing to solve the problem by the number attempting it.

5. Turn to tables of the normal curve (see Holzinger, Rugg, Pearson, et al) and calculate the standard score for each problem from the proportion of pupils failing to solve the problem. The relative values of the standard scores represent the relative difficulty of the test items.

Comment on Findings: 1. The teacher found that the policy of attaching the same value to each item in an arithmetic test was not defensible on this basis. Items in the same tests were found to be two or three times more difficult than other items.

2. The teacher found it helpful to allot the time for

practicing the skills required in solving each type of problem on the basis of relative difficulty. Thus, a problem twice as difficult would indicate that the time for practicing the skills represented by that problem should be greater than the time allotted to the practice of skills required in solving an easier problem.

Hygiene — Elementary Grades

Problem No. 8: To test the dietary habits of fifth-grade children as a means of measuring the application of hygiene to life situations.

Major Assumptions: 1. That the objectives of the course in hygiene include statements of the dietary habits to be developed.

2. That the choice of food for the noon meal and the procedure followed in consuming this meal represent the typical habits of individual pupils.

Procedure: 1. Have menu slips prepared to be used in the school cafeteria upon which each pupil checks his selection, signs his name, and then deposits with the cashier.

2. Collect the slips each week and check the daily selections against the desired dietary selection. For each pupil note his general habits as indicated by the more frequent selections over a period of a week or more.

3. Check an objective as having been attained by the pupil when the desired selection has become a "general habit."

4. Arrange to have the entire grade seated together in the cafeteria and observe and note upon cards the presence or absence of desired mastication habits.

Comment on Findings: 1. The teacher discovered that pupils required a much greater period of training to develop proper eating *habits* than was required to learn the necessary *information* needed to guide in food selection and mastication.

2. She found a low correlation between estimates of the attainment of the objectives when measured by information tests and when measured by cafeteria habits.

3. Score cards were developed to stimulate the pupils' attention to the various habits emphasized. Each pupil rated himself at each meal, noting the dishes chosen and the time required. While the entries were entirely unreliable, the procedure was useful as a motivating device.

General Science — Secondary Grades

Problem No. 9: To determine types of test that are best adapted to the testing of each type of objective in a given general-science course, ninth grade.

Major Assumptions: 1. That the attainment of each objective of the course is capable of measurement to some degree.

2. That different types of objectives require different types of test.

3. That the desired outcomes contributing to each

objective are useful in suggesting content for the tests of each type.

Procedure: 1. Collect as complete a list as possible of the specific difficulties met by pupils in performing the learning activities intended to realize such objectives as command of the facts contained in the unit; ability to employ the attitudes, habits, and skills that make for efficient methods of study; ability to solve science problems of real life; and wholesome interests in the scientific features of the environment. Obtain the difficulties by observing pupils at work, by specially prepared class exercises, and by personally interviewing pupils who have most difficulty with the work in general. Classify the difficulties according to the objectives, then sub-classify according to the types within each class.

2. Collect sample copies of the published general-science tests that contain exercises likely to involve each type of difficulty recorded. Whenever a published test is found to cover a sufficient number of the difficulties classified under a given objective, retain the test as a test of that objective.

3. Where certain other types of difficulties are involved in the exercises of certain tests but are not sufficiently emphasized to justify using the test as a measure of the objective, prepare other test exercises until the type difficulties relating to the same objective are covered.

4. Where no test is found to contain exercises involving the type-difficulties of one or more objectives, prepare tests of such objectives by building the test around the classroom activities in which the type-difficulties arise.

5. Try out the published tests selected, the tests adopted from appropriate sections of the published tests, and the self-constructed tests. Rank the pupils first according to any available evidence regarding their attainment of each objective separately. Then rank the pupils according to their attainment of each objective on the basis of the test intended to cover that objective. Compare the ranks and make such changes in the tests as are clearly desirable.

Comment on Findings: 1. The recorded type-difficulties occurred in connection with such activities as obtaining precise meanings from the textbook, selecting the best method to use in solving a problem, relating the purpose of an experiment to the textbook discussion, reading diagrams and tables, and distinguishing between major and minor points.

2. The published tests found useful as a basis for constructing the type of test desired were the Denver Curriculum Semester Test in General Science, the Dvorak General Science Test, the Giles-Thomas-Schmidt General Science Examinations, the Powers General Science Test, and the Ruch-Popenoe General Science Test.

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CHAPTER V

PROBLEMS INVOLVING MANAGEMENT

1. Summary

The term "management" is used to designate the activities that serve to establish and maintain the conditions necessary for efficient teaching. Management should be subservient to teaching. Efficient teaching means efficient learning. Management, then, in its various aspects, is the process whereby school conditions are controlled so as to facilitate the learning process. Management provides the stage, the settings, and the properties necessary for the satisfactory performance of learning and teaching activities.

The chief difficulty in defining problems of management for purposes of investigation consists in the fact that the objectives of management are determined by educational objectives; hence a clear cut problem in management always derives its definiteness from specific local conditions that can seldom be generalized. Even so conventional a problem as the organization of an educational guidance program becomes hazy when the investigator attempts to prepare such a program for schools in general. The problem is clarified in the degree to which the pupils concerned are pro-

gressively restricted to a given locality, school, grade, sex, age, and degree of mental ability.

Another difficulty in defining problems of management for investigation is that specific and local problems of administration receive very scant attention in professional literature. The administration of conditions that most directly affect the teachers' work involves a wide variety of problems restricted in scope to the plant and staff of a single school. No general principles carry the individual superintendent or principal very far toward the solution of such problems. Hence each problem needs to be investigated by the administrator concerned. The present chapter undertakes to offer illustration and advice whereby methods of conducting such local investigations may be improved.

Since school administrators have more frequent opportunities than teachers to investigate problems of management, the procedures outlined in the sections to follow will be of interest to the administrator and supervisor as well as to the classroom teacher. The problems themselves are all of direct concern to teachers. For service study procedures applicable to *purely* administrative problems, such as the relation of the school to community agencies, the construction of class schedules, the administration of credits, and the construction of school buildings, the reader is referred to the abundant literature on school administration wherein such problems are explored.[1]

[1] For example, *Problems in Educational Administration*, by Strayer and Englehardt, Bureau of Publications, Teachers College, New York.

The distinction between the purely administrative aspect and the classroom-teacher aspect of administrative problems suggests a similar distinction between research problems and service problems in the field of school administration. The typical research problem in educational administration is well represented by the need for a formula by which to compute the amount of funds to be contributed by the state, the county, and the school district respectively toward the maintenance of schools of a given type. To determine the correct formula it is first necessary to assemble the facts regarding the funds available from each unit, the facts regarding costs over a period of years, and such facts regarding the school population as may serve to define present trends and future needs. On the basis of the facts, various ratios are applied to different school districts and revised until a certain ratio is found that provides the funds necessary for any district and also stimulates local initiative by taxing the community in proportion to its wealth.[1]

A study of this type has all the characteristics of a research as distinct from a service study. The findings bear a wide application. The data must be obtained largely from primary sources. The techniques are quantitative. Many of the assumptions are capable of verification, also in quantitative terms. Furthermore, to conduct such a study successfully, the investigator

[1] For a study of this type, see H. C. Updegraff, *Joint Committee on Rural Schools, Rural Survey of New York*, Vol. III.

has need for highly specialized training, an extended period of time, and usually a subsidy of several thousand dollars for clerical assistance, printing, traveling expenses, and other facilities needed to carry through the investigation.

There are various sub-problems implied in the foregoing research, however, that might well be regarded as service problems and investigated by service-study techniques. Such problems might not be recognized as problems by the research student of school administration, since the elements that touch the classroom teacher or supervisor have often slight importance beyond the given community. Such elements represent sub-problems like the following: how to evaluate the educational needs of the community that involve a more extensive program and additional funds, how to advertise the needs of the given school so that the local community may support it more willingly, how to select adequate facilities within the available funds, and how to meet the standards set by the state department for certain features of instruction so that the given school may qualify for larger appropriations of state money. While such problems are seldom acute from the standpoint of the individual teacher and supervisor, they are acute from the standpoint of the administration and they represent problems that can be solved to best advantage when systematically attacked with the cooperation of the teaching staff. The few examples given should be enough to emphasize the

distinction between the research problem in school administration and the service problem in school management. The following paragraphs define the latter more clearly.

Typical Service Problems. — Because problems in management constitute, so to speak, the background of problems in teaching, it is somewhat difficult to mark off the territory to be explored in this chapter. Yet by reviewing briefly both of the type problems, it may be shown that each represents a somewhat coherent unit.

The first type of problem in management involves the assignment of pupils to the proper grade, class, or section within the class. Considered strictly from the administrative standpoint, the various procedures described in the literature for classifying pupils on the basis of standard tests may be reasonably adequate. Even so, the wise administrator bases such classification on data not obtainable by standard tests. From the standpoint of teacher and supervisor, there are many serious problems of classification that do not yield to any standardized procedure. It is sometimes entirely obvious that an accepted method of classifying pupils has not been successful in the case of certain individuals. To correct the errors by moving pupils about experimentally is wasteful of time and unjust to the pupil. For such problems the service study is more likely to suggest wise solutions than either the findings of research in school administration, the

teacher's random experiments, or the offhand decisions of the principal.

Coming closer to the type of problem discussed in the preceding chapters, we meet the second problem of managing the class. Activities involving the distribution of supplies, note taking, preparation of papers, use of books in the classroom, and such learning techniques as listening to explanations and organizing ideas before writing, require the collection and study of data by service-study procedures. When the problem of teaching routine classroom activities receives the same care that is normally given to the problem of teaching subject matter, the latter problem becomes far less troublesome to the teacher of average ability.

A sub-problem which is discussed in the section on management, involves the selection of facilities for the pupils' comfort and welfare and for the efficient conduct of instruction. Such facilities include the school plant, equipment, supplies, adequate time in which to accomplish desired results, and various other items and conditions required for efficient teaching. Bennett's *Study of Pupil-Postures and Desk Dimensions*[1] illustrates a type of research in the field of school equipment that best facilitates the service study. On the basis of the data presented by Bennett, any teacher can readily assemble the facts required to solve many seating problems in a particular school. Similar studies of time allotments, space requirements, ventilation,

[1] H. E. Bennett, Doctoral Dissertation, University of Chicago, 1925.

and other facilities may usually be found to supply the basic data by which the service study may analyze and prescribe for given conditions.

Having decided what facilities are best one meets the problem of securing funds to meet the cost of the facilities or of improvising the facilities without funds. While both are strictly service problems, it is not easy to describe procedures for investigating them. How to secure the funds needed for a certain purpose in a given school is so largely a matter of knowing what persons to approach and how to approach them, that no one type of procedure is likely to fit more than one situation. How to improvise facilities is also more dependent upon the teacher's resourcefulness than upon methods of systematic study.

The extent to which the foregoing problems may be considered coherent and distinct from the problems discussed in the two chapters preceding will largely depend upon the type of school situation with which the particular reader is concerned. In certain well-supported schools, it is probably true that none of the problems mentioned are allowed by the administration to become so acute as to cause the teaching staff any great concern. Yet for every one school of this type there are at least fifty schools in which teachers should be actively concerned with one or more of the type-problems described. This being the case, it matters little whether or not the problems of management can be set apart from other service problems as a distinct

group. It matters much, however, whether administrators, supervisors, and teachers give these problems merely casual attention or whether they proceed to study the problems systematically. The clear definition of a service problem in management is often the most difficult task in its study. When the problem has been defined, its investigation is usually simpler than the investigation of problems involving the curriculum and methods of teaching. Hence the procedures to be outlined are less detailed and leave more to the investigator's initiative as directed by the immediate circumstances.

Assumptions. — It has been argued that service problems in management represent points of contact between problems of administration and problems of classroom teaching. On this account any study of a problem in management to be conducted by a single administrator, supervisor, or teacher in service must make various general assumptions; otherwise it becomes necessary to investigate the administrative policies involved and also the teaching problems affected. While the specific assumptions are stated for each of the problems discussed, it may help in defining the content of the chapter to mention the assumptions common to both problems.

Each study requires first the assumptions that the educational objectives have been wisely chosen for the given school population, that a curriculum has been organized with reference to the objectives, and that

efficient methods of teaching the prescribed subject matter have been developed by the teaching staff. Unless these assumptions are made, there is grave danger that the study may pervert the fundamental objectives of instruction to the convenience of the administration, allowing administration to be regarded as an end of the school's activity instead of a means of accomplishing the primary educational purposes. To offset this tendency, the problem in management should represent a problem in teaching that cannot be solved adequately until certain administrative conditions are investigated.

A second assumption is that the fundamental policies of administration are consistent with the educational objectives and subordinate to them; also that such policies are essentially sound. This assumption prevents the person conducting the study from being drawn into the investigation of problems that, after all, have slight relation to teaching. Unless he happens to be a competent student of school administration as such, the investigator does well to assume the wisdom of fundamental policies affecting the problem in management and then seek solutions for the problems that square with a reasonable interpretation of the policies in force.

A third assumption is that the literature on school administration contains data relevant to the problem studied and that such data may serve as criteria in selecting remedies for the problem. Without this

assumption, the investigation is likely to involve a study of primary sources such as census reports, cost trends, statewide survey tests, and the like, which exceeds the practicable limits of the service study contemplated. A related assumption is that the teacher has access to school records containing such facts as are needed to understand the local problem fully, when such facts are not readily collected at first hand by the investigator.

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2. Classifying and Sectioning Pupils

(Type Problem III A)

The task of grading, classifying, and sectioning pupils is an essential step in the organization of a school. Unless pupils are organized in groups, the machinery of school administration can not operate. There are many varieties of criteria by which the groups may be formed. There is accordingly an almost continuous range from the classification based entirely on administrative convenience to the classification based on facts regarding pupils' needs. Methods of classification based largely upon administrative convenience should be avoided for reasons suggested in the following summary:[1]

Among the more conspicuous evils resulting from grouping on the "quota" basis may be mentioned the virtual impossibility of securing textbooks properly adapted to the variety of needs to be found within any one pupil group, the

[1]Based upon A. H. Sutherland, *Twenty-fourth Yearbook of the National Society for the Study of Education*, Part II, pp. 18-30.

greater difficulty met by the teacher in recognizing and providing for individual needs when the needs of any one class group are so heterogeneous, the further complication of the teachers' task by the over-sized classes which the "quota" system encourages, the large proportion of pupils who are retarded because of insufficient personal attention and the many specific evils resulting from retardation, the large proportion of pupils who leave school so soon as the attendance laws permit, the tendency to allow bright pupils to skip grades to their own serious disadvantage, the variations in quality of work to which the teacher cannot give proper attention, and many other maladjustments of like nature.

For the evils just mentioned, widespread experiment of the trial and error sort has produced many different types of remedy. To list such remedies with any degree of definiteness would require considerable space. The following list of types is by no means complete but suggests the variety of organizations designed to minimize the evils of casual grouping:[1] coaching pupils privately who fall behind the class, allowing more time for backward pupils to do the prescribed work, making special study of and provision for pupils who are in any important respects peculiar, grouping pupils in classes on the basis of general ability — as shown by mental tests — and then by attainments in the given field of subject matter, adapting assignments to the abilities of pupils within the class group, organizing

[1] Selected from the *Twenty-fourth Yearbook of the National Society for the Study of Education*, Part II, *passim*.

all class work in certain subjects upon a strictly individual basis, combining group and individual assignments for any subject — as in laboratory work in the natural sciences, providing "adjustment rooms" in which peculiar needs may be met by teachers specially trained for such work, and by various combinations of these type organizations as developed by particular schools. The reader will note the absence in the foregoing list of familiar labels — such as the Dalton plan, the Winnetka plan, the Gary plan. Since the same label is applied to so many different types of organization, it is wise to specify the basis of organization to avoid confusion.

In distinguishing the bases of classification for the school as a whole from the bases applied to the single class, we recognize the familiar distinction between the research and the service study as applied to the problem of pupil classification. The collection and interpretation of the data required to devise an adequate means of classifying the school as a whole is a research problem, to the extent that no assumptions are made regarding the individual differences to be minimized by the plan of grouping. On the other hand, diagnosis of and provision for the individual needs within the class is strictly a service problem, since the investigator must assume the desirability of conditions beyond the classroom teachers' control.

Research to determine an adequate basis for classifying the school as a whole has become somewhat ex-

tensive especially in the elementary schools of large cities. Of the various accounts of statistical techniques that may be used for diagnosis and classification, one of the more comprehensive is a recent volume by Van Wagenen.[1] The reader is referred to this source for specific accounts of researches in pupil classification for a city elementary school, a small city trade school, a large city elementary school, and a junior high school. Among the various criteria utilized are data concerning mental age, rate of achievement, degree of attainment in specific subjects as measured by standard tests, quality of work, variation in specific traits, and other significant factors in learning.

It is no small task to collect data regarding each of these factors, to assign proper weights to each factor, to prepare a formula in which each factor is duly represented, and to apply the formula systematically to the classification of an entire school. Even though the task were less complicated, the dangers attending the use of such techniques by untrained principals or teachers are sufficiently great to discourage their use. Until further research has developed formula that may be applied somewhat mechanically to data obtained by standard tests, it is probably wise for the majority of administrators to classify pupils by more empirical methods.

A less complicated method of classification is not far removed from the prevalent practice and brings

[1] M. J. Van Wagenen, *Educational Diagnosis*, Macmillan, 1926.

the problem well within reach of the service study. Essentially this method consists in classifying pupils with reference to three sorts of data that are readily obtained; namely, mental age, composite scores on standard achievement tests in the various subjects, and teacher's estimates of the pupil's abilities as a worker in each subject separately. When grade groups, sections within the grade, and sections within the departmental courses of the high school are so formed as to contain pupils most nearly alike in each of these respects, the classification has probably been standardized to the limit of practicability in most schools for the immediate future. Adjustments needed to improve this major classification may then be cared for in two ways, both of which involve service study procedures.

The first method of adjustment is to provide opportunities for specially qualified teachers to give special instruction to pupils of the same grade or department who fail to benefit by instruction in the regular class. The number and nature of such "remedial groups" or "adjustment groups" will naturally be determined by conference with the teachers concerned and by the specific difficulties met both by teachers and by pupils in the work of the organized classes. Any such provision for adjusting individuals to the group organization depends upon the school budget, the size and competence of the staff, the space, and other facilities available. This method of adjustment is therefore best

selected in the light of such local conditions and revised on the basis of experience.

The second method of adjusting the primary classification described is to study the needs of pupils from the standpoint of the teacher's difficulties in securing the desired results. To this type of adjustment the service study also applies directly. While the teacher is the agency for collecting and interpreting the data, the sort of adjustment desired is not likely to be achieved without the active interest and direction of the principal. Not until pupils' needs and difficulties have been determined with specific reference to the objectives of individual classes, can the classification of pupils contribute directly to the educational aims of the school. The data obtainable by teachers under wise direction and by service study procedures are considerably more significant at present than the data obtained by standard tests exclusively.

Problems. — The sub-problems to which this section is addressed are thus confined largely to the diagnosis of individual needs within the grades or classes formed on the basis of mental age, standard test scores in the various subjects, and teacher's ratings of ability to do the work in each subject. The first sub-problem consists in identifying the pupils requiring further adjustment or special treatment within the given subject. A second sub-problem involves the selection of the criteria to be applied in selecting pupils who need the same type of treatment. The third sub-

problem requires the application of the criteria to the members of a given class group.

Assumptions. — 1. It must first be assumed that the existing classification of the school as a whole permits efficient learning by the majority of pupils in each class. Stated conversely, the assumption is that the necessary adjustments in classification can be made without completely reorganizing the entire school or part of the school concerned.

2. A second assumption is that the existing classification can be modified to the extent of providing special instruction for pupils having the same needs in common — when such needs are out of line with the regular class instruction, provided that such pupils are numerous enough to constitute a class of normal size.

3. It must further be assumed that the administration will make all reasonable efforts to form grade sections on the basis of needs in particular subjects.

4. One must also assume that the prescribed subject matter has been well selected and the basic learning procedures well adapted to the needs of the majority in each class.

5. A final assumption is that with the principal's direction each teacher of the staff is able to specify the needs of each pupil from the standpoint of desired outcomes for the given grade and subject, and is also able to group pupils by applying whatever criteria are suggested by such needs.

Type Procedure. — As implied by the assumptions,

the typical service study of this problem consists in directing the teachers' efforts to define a basis of classification best adapted to efficient learning in the given subject. When such bases have been determined, the general organization of classes may more easily be improved by providing special instruction for pupil groups not well adjusted to regular classes. For this reason the procedure is primarily confined to the individual classrooms in which the diagnosis is first undertaken.

The Problem. To identify the pupils who require special treatment in order to attain one or more specific objectives of the grade or department and to classify such pupils on the basis of common needs.

Abstract of Procedure. a. (Optional.) Request each teacher of the grades or departments concerned to analyze the prescribed course of study into the learning activities, attitudes, abilities, and types of information necessary to attain the desired outcomes of each course. These data are perhaps best presented in the form of three parallel columns headed, respectively, "topical outline of course," "methods involved in learning each topic," and "desired abilities developed by each method."

b. (Optional.) Ask each teacher to list for each of the desired abilities and attitudes the various tests or methods by which to determine the degree to which the ability or attitude is present in the individual pupil — for example, standard tests to show presence

of ability to organize the prescribed readings, private interviews to determine the pupil's interest in the subject, and the like.

c. (Optional.) Combine the various methods and types of tests suggested by preparing a master list that is classified according to the specific outcomes to be tested. Refer the master list to the teachers and ask each teacher to revise the list he first prepared by adding to it any of the methods from the master list considered equally useful.

d. (Optional.) Have each teacher apply such of the tests to the pupils in each class as will serve best to reveal significant differences in their mastery of the given subject. Request each teacher to submit a list of the more significant differences revealed.

1. Confer with the teachers of each grade or department separately to decide upon the type of ability, attainment, or other type of difference most useful as a basis for classification. Wherever two or more bases appear equally important, decide if possible upon a method of combining them.

2. Ask the teachers of each grade or department to select pupils who are sufficiently alike in important respects to compose separate classes; then organize the classes tentatively according to the teachers' recommendations.

3. When sufficient time has passed to reveal pupils not adjusted to the work of their classes, ask the teachers to send to the office the names of such pupils,

together with a statement of the type of attainment in which each is weak and suggestions regarding the type of instruction to be provided. Classify such pupils according to the nature of their special needs and form remedial groups whenever the number with similar needs is large enough to form a class.

Type Study. — The study here used for illustration concerns the selection and classification of pupils within the English department, grades 10 to 12, on the basis of their attainments in the social uses of English literature. The instructor reporting the study[1] says, ". . . in the making of the English curriculum, it would seem desirable so to group courses with relation to objectives, so to separate habit-forming and informational courses, as to make it possible for the child who has profited by home training to avoid identical training to any large degree in his school work."

Problem. To define and apply criteria appropriate for selecting high school pupils whose interests and qualifications for voluntary reading justify exemption from the expository type of course prescribed for other pupils.

Assumptions. 1. That classification for purposes of instruction in English in grades 10-12 should be less dependent upon the amount of previous schooling and more dependent upon the pupils' mental and social and literary attainment than the usual grade classification.

[1] Lou LaBrant, "Certain Criteria for Classifying Pupils in Literature Courses," *School Review*, XXXV: 458-466. By permission.

2. That the following bases for classification are superior to the grade basis: intelligence quotient; rate of reading; comprehension; vocabulary; ability to interpret literature, as judged by the teacher; and outside reading habits, as indicated by summer reading and other non-credit reading.

3. That teachers are competent to apply the criteria.

Procedure. (See the foregoing Abstract of Procedure for complete list of steps.)

Step 1

"Decide upon best basis of classification after collecting teachers' suggestions."

The following bases for classification were selected in conference by members of the department and applied in the manner described.

The results of four sets of objective tests and the teacher's judgment based on definite suggestions were considered. The standards were arbitrarily chosen, their justification being left for the outcome of the teaching experiment. It was our purpose to initiate a new classification of pupils in literature by selecting a group of superior readers. Data for the whole department were available, and further groupings were discovered, as will be indicated. The criteria used were as follows:

1. *Intelligence quotient.* — Only those pupils were regarded as suitable for the superior group of readers for whom scores on intelligence tests indicated a mental age of eighteen years. This means a minimum I.Q. of 112 if we accept sixteen as the maximum divisor. The age of eighteen was

chosen to accord with the standards of achievement. In the experimental class this mark seemed to be justified, since a group of such pupils tends to read widely and often intensively. We wished to avoid the danger of monopolizing the time and interest of a pupil who had not sufficient ability to carry his whole high school load with comparative ease.

2. *Rate of reading and comprehension.* — The Thorndike-McCall reading test was used. Pupils who reached the twelfth-grade norms in rate and comprehension were accepted. A test based on both these elements seems desirable. Our experiments with both superior and markedly inferior pupils indicated a distinct relation between the ability to read rapidly and the ability to read for pleasure. The slower readers preferred two short books to one long book. Careful records to determine the relation of speed to reading habits need to be made. It is probable that, as teachers of literature, we underestimate the effect of rate on appreciation.

3. *Vocabulary.* — The pupils were given the Holley test in vocabulary. This test is easily given and shows the pupil's ability to recognize meanings of words used in sentences. It is therefore suitable for the purpose of evaluating reading ability. In this case, as in the case of the other tests, the twelfth-grade norm was chosen as the standard for the superior group.

4. *Teacher's recommendation.* — While the teacher's opinion in the selection or classification of pupils is always subjective, certain definite suggestions tended to make judgment in this case more objective. Only those pupils were considered who had met the mechanics requirements of the objective tests named. Ability was therefore largely established. The teachers were asked to consider especially the

readiness of the pupil in interpreting literature and his reading habits as evidenced by reading not offered for credit. Summer reading was given special consideration. The information was secured through informal conferences. In two cases it was apparent that the pupils, while capable of reading rapidly a wide variety of subjects, were too immature socially to make it seem advisable to include them in a class such as planned. These pupils were scheduled for special reading classes later in their high-school work. Since we wished to avoid undue emphasis on any superior ability or advantages possessed by any group, the pupils were told that classes were to be opened for those especially interested in certain lines or types of reading. Marks were not considered. In several cases the teacher found evident relief in the readjustment which the new classes made possible for pupils who had previously been problems. In schools using the plan of sectioning according to general intelligence such maladjustment would probably be less evident. Even among superior pupils, however, there are wide ranges in reading habits and in reading ability.

Step 2

"Organize classes tentatively, composing classes of pupils who are alike in important respects."

Of approximately sixty candidates, eight qualified for the special class. Of these, five were from homes where the opportunities for reading would probably be considered superior. Arrangements for a continuation of the plan were made. For this second class seven of a possible fifty-five were eligible.

. . . The pupils selected were superior readers. It would

be logical to classify other pupils who have well-established reading habits but less ability and to give them material adapted to their interests and abilities. We need, indeed, to discover the point at which, for any given general ability, certain marked disabilities in the mechanics of reading make reading for pleasure an impossibility. For example, James, who is fifteen years old and has average mental development, has a reading ability corresponding to the fifth-grade norm. The bulk of material at this level does not appeal to James, since it is unsuited to his reading development. He therefore says, "I don't like to read," although he thoroughly enjoys having someone read to him. Apparently, it is useless to attempt to train James to develop habits of leisure-time reading until James has had remedial work in the mechanics of reading. This extreme case is clear, but there is a wide range of pupil ability, and classification must wait for both experiment and psychological investigation. In using for the experiment only those with superior ability we merely began the task of diagnosing the needs of the pupils.

Step 3

"Revise classification by forming additional groups of pupils requiring the same type of supplementary instruction."

The experimental revision and extension of the classification is described as follows:

It is easily possible that other pupils in the school from which these were chosen could have enjoyed a careful class discussion of many of the books read by the special class. It is, however, exceedingly doubtful whether many could

have read with sufficient ease and *enjoyment* to have found this course or this type of course an open door to future leisure-time reading. The same criteria revealed a group of less rapid and generally less capable readers who were reading steadily in leisure periods. These pupils also would probably have been able to profit by a course in exploratory reading, a course somewhat less pretentious but equally valid. A third group was composed of those pupils whose outside reading was negligible and whose rate of reading, comprehension, and vocabulary were markedly below what their mental ability would indicate as normal. Only one or two of these pupils made any claims to outside reading, and in every case such reading was confined to an extended acquaintance with but one or two writers. It appears to be folly to expect such pupils to enjoy reading until it becomes less difficult for them.

In part as a result of the experiment with superior readers, the English department is attempting to meet the needs of the least-skilled group through a course in remedial reading. Two methods are used: (1) quantity reading of simple material to increase speed and (2) class reading, conducted with full consideration of rate difficulties, to increase comprehension. Results are not yet evident save in the growth of pupil interest. This course, dealing with mechanics and habit formation, is scheduled for nine months.

Further experimentation should add other and more reliable criteria for classifying pupils with regard to reading ability, but the writer is convinced that, if these tests — vocabulary, rate of reading, comprehension, summer-reading records, general interpretation, and intelligence — are employed, it will be possible to develop a grouping based on ability and closely related to professed objectives.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

1. List of specific objectives for the course.

2. Specific abilities and methods involved in attaining each objective in the course.

3. List of tests for measuring the attainment of each important objective, ability, and method of work involved in the course.

4. A list of important specific objectives, abilities, and methods of work involved in the course.

5. List of tests most valuable in measuring the

SOURCES	TECHNIQUES										
	Analysis	Observation	Personal Interview	Group conference	Question blank	Check list	Experiment	Testing	Group rating	Individual Evaluation	Sampling
Pupils in the class		**2,7,10**	**2,7,10**				**11**	**6,7,10**			
Teachers			**2,3,8,** 10, **11**	2,3,8, **10,** 11	2, 3, 8	2, 3, 8			**4, 5**		12
Supervisors			**2,3,8,** **10, 11**							**4, 5**	
Authorities on teaching					2, **3,** 8, 11	2, 3, **8,** 11			**4, 5**		
Professional literature on special methods	**2,3,**8										
on classification of pupils	**3,5,**8										
Texts, syllabi, courses of study	**1,2,**3										
School records	**7, 10**										

Boldface figures indicate essential steps; others are optional.

[1] The twelve types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES					
	Analysis	Individual Evaluation	Comparison	Classification	Tabulation	Sampling
List of specific objectives for the course	**2**	**4**	....	....	....	....
List of specific abilities and methods involved in course	3	**4**	....	....	....	12
List of tests for measuring objectives, abilities and methods	....	**5**	....	....	....	....
Test results and results of observation and interview of pupils	**6**	**6, 7**	**7**	....	**7**	12
List of significant differences in the abilities of pupils	**8**	**9**	**9**	8	....	....
List of abilities to be used in sectioning pupils	....	....	**9**	....	....	....

Boldface figures indicate essential steps; others are optional.

attainment of the important objectives, abilities, and methods of work.

6. Relative attainments of each pupil as measured by the tests.

7. List of significant differences in the abilities of the pupils.

8. List of abilities to be used in sectioning pupils.

9. List of pupils to be placed in each section.

10. Pupils not properly placed.

11. Suggestions for improving plan of sectioning.

12. Valid and reliable results.

Specimen Service Studies. — For various reasons related to the departmental organization, it is usually easier to classify secondary school pupils according to the abilities required in particular subjects. For this reason the specimen studies concerned with elementary grades make the better illustrations. The procedures apply equally well to high-school subjects wherever

the number of pupils enrolled for the same course permits the formation of several sections according to criteria peculiar to the subject.

Arithmetic — Elementary Grades

Problem No. 1: To identify at the beginning of the year the pupils in a fourth-grade arithmetic class who require a different classification.

Major Assumptions: 1. That pupils must have acquired certain arithmetical abilities in order to benefit by the work prescribed for the class as a whole.

2. That some of the abilities prerequisite for fourth-grade arithmetic may be tested by standard tests available.

3. That the remaining abilities may be tested or estimated by other methods and devices prepared by the teachers concerned.

Procedure: 1. Request all fourth-grade teachers to go over the fourth-grade course of study, item by item, and to note the specific abilities presupposed for success in the course as taught. The specific abilities may be expressed either as facts to be known, skills acquired, traits developed, or as combinations of these elements.

2. Combine the abilities reported by the fourth-grade teachers into a master list and submit the list to the second- and third-grade teachers, asking them to add other abilities taught in their classes that were not reported by the fourth-grade teachers.

3. By the consensus of fourth-grade teachers, select the abilities from the master-list that are considered prerequisite for success in undertaking the work of the typical fourth-grade class.

4. Obtain sample copies of standard tests in elementary arithmetic. Submit the tests to the fourth-grade teachers for examination with the request that they select any of the tests which apply to one or more of the prerequisite abilities designated. Individual tests like the Buswell-John tests may well be selected in spite of the greater time required to apply them.

5. Where the prerequisite abilities to which no standard tests apply are considered particularly important — as for example, the ability to solve new problems — the teacher may be asked to retain the pupils in the class for further observation until the presence or absence of the abilities can be determined.

6. Apply the standard tests selected, summarize and combine the scores, and designate the pupils scoring below the median in all tests as candidates for a special section.

Comment on Findings: 1. Such abilities as the following were considered prerequisite to success in the typical class:

(a) the ability to add at least five four-place numbers.

(b) the ability to subtract one four-place number from another.

(c) the ability to multiply a three-place number by a two-place number.

(d) the trait of arithmetic accuracy applied to each of the above types of problems.

2. Tests which permitted the teacher to observe the work of each pupil proved more helpful than the conventional group tests because they provided facts useful in determining the type of special treatment each pupil required.

Written English — Secondary Grades

Problem No. 2: To identify at the outset of the ninth grade those pupils whose deficiencies in written English are sufficiently serious to justify their being assigned to a special class in English usage.

Major Assumptions: 1. That a certain proficiency in writing is essential to success in all courses required of ninth-grade pupils.

2. That instruction appropriate to the needs of each pupil is provided in the special class in English usage.

3. That all teachers will cooperate in selecting pupils in need of the special instruction.

4. That such pupils may be selected on the basis of the errors made in test exercises that are designed to cover the types of writing ordinarily expected of the pupils in the various courses required.

Procedure: 1. Ask all ninth-grade teachers to spend the first few days of their courses in preparing the

pupils to write compositions. The purpose of this preparation should be to supply ideas to be expressed and sufficient background to insure fluent expression.

2. Ask the teachers to have all pupils write two or three papers on attractive topics during the first two weeks. Refer the papers to a specially selected group of teachers who for proper compensation or relief from regular duties will check through the papers, marking the errors and classifying them by the principles of composition violated.

3. Apply a battery of standard diagnostic tests in English composition to all ninth-grade pupils. Score and classify errors as before.

4. Designate for the special class in usage all pupils who are noticeably ignorant of certain fundamental conventions in writing or who are unduly careless as shown by the number and variety of errors made.

Comment on Findings: 1. The tests proved entirely satisfactory in revealing pupils' deficiencies. Not all the pupils chosen for special instruction could be accommodated, however.

2. The special class was recruited after the first semester by the nominations of teachers based upon the regular written work of their classes.

3. The exercises used in the special class were constructed to cover the particular principles of usage most frequently violated by a significant proportion of the class.

Reading — Elementary Grades

Problem No. 3: To determine the most adequate bases for classifying first-grade pupils in preparatory reading classes.

Major Assumptions: 1. That the degree to which pupils are ready to begin reading has much to do with the development of efficient reading habits in the reading class.

2. That first-grade pupils differ widely in regard to their readiness to learn to read.

3. That such differences may be determined and may be used as criteria in classifying pupils for purposes of instruction in reading.

Procedure: 1. From professional literature make a tentative list of characteristics pupils should possess who are ready to learn to read.

2. Submit the list to the teachers of primary grades for the addition of any other characteristics considered important.

3. Revise the tentative list to include the additions, then return the revised list to the primary teachers who are asked to designate items of two types. The first type consists of characteristics considered prerequisite for reading, many of which will develop in time without any systematic instruction. The second type consists of characteristics that must be developed by class instruction before the pupil is ready to read.

4. Summarize both types of characteristics as indi-

cated by the teachers and present the summaries to a meeting of all primary teachers. When the essential characteristics have been fully discussed and a common interpretation reached, decide upon the characteristics to be used in classifying pupils as prospective readers.

Comment on Findings: 1. *The Twenty-Fourth Yearbook*, Gates, and Gray were found to give the most helpful characteristics of any of the professional books.

2. The following criteria were selected for use in classifying pupils in the pre-reading class:

(a) the possession of a fairly large (2000 word) oral *English* vocabulary based upon previous experiences in home and community,

(b) the possession of a desire to secure meaning from the printed page,

(c) a duration span of directed attention of upwards of twenty minutes, and

(d) the possession of general intelligence not markedly below the average.

3. The sections of the pre-primer class provided specific training for deficiencies in a, b, and c respectively. For pupils lacking a normal degree of general intelligence, longer and supplementary periods of training were given in each section.

Community Civics — Secondary Grades

Problem No. 4: To define criteria useful in sectioning a ninth grade enrolling nine hundred pupils, for

each of whom the full year course in community civics is prescribed.

Major Assumptions: 1. That the nature of the course takes for granted some first hand acquaintance with the life of a large city which the typical pupil acquires by observation.

2. That the needs of pupils having different degrees of experience with civic enterprises require different types of instruction.

3. That the nature of the instruction, and therefore the basis on which the various sections are formed, depend also upon the pupil's abilities to learn the basic subject matter taught in all sections.

4. That the seven teachers of civics are genuinely interested in the problem and may be depended upon to cooperate to the full.

Procedure: 1. Apply to all ninth-grade pupils the Hill tests of Civic Information, Civic Attitudes, and Civic Action. Score and tabulate the distribution of the scores for convenient reference.

2. Request the teachers to prepare, confer upon, and revise a list of items to be included in a questionnaire for the purpose of obtaining facts about the pupils' civic experiences. Submit the questionnaire, when approved by all teachers concerned, to all pupils of the ninth grade.

3. Request the teachers to prepare also two lists of pupils from their records of the previous year; one list to contain the names of pupils of outstanding ability

in the subject; the other, the names of pupils who failed the course and those whose work was conspicuously poor. Have each teacher supply a paragraph concerning each pupil to explain the reasons for his success or failure in the subject.

4. Appoint a committee of teachers to consult the office records concerning the pupils reported by any teacher as exceptionally good and exceptionally poor in civics. Compare the data obtained concerning these pupils and note the items most safely used to predict success or failure in the typical civics course.

5. Summarize the data secured from each of the sources mentioned and star the items that appear to have the most diagnostic value. Present the list of items to a conference of the civics staff and select a few of the items that appear most significant and most easily applied as criteria in forming the sections.

6. Section the grade on the basis of the criteria selected. Test the adequacy of the classification at the close of the first semester by taking a representative group of one hundred ninth-grade pupils and ranking them in order of ability to succeed in civics as predicted by the data on which the sections were formed. Rank the same group also on the basis of teachers' marks and correlate the ranks. If the correspondence is by no means close, revise the criteria on the basis of the teachers' recommendations for further experiment.

Comment on Findings: 1. The most helpful criteria

proved to be the Hill standard test on civic information, attitudes, and actions, particularly the first. The next most helpful criterion was the pupils' ability to describe various social movements in a paper of 300 words. Four criteria in all were used.

2. The thirty sections were almost normally distributed, the number of sections containing pupils above the median rating being somewhat larger since the classes containing the less able pupils were smaller.

Reading — Elementary Grades

Problem No. 5: To section a second-grade reading class into homogeneous groups to facilitate instruction.

Major Assumptions: 1. That the following criteria, as derived by the procedures outlined for problem No. 3, are adequate for the classification desired:

(a) the ability to interpret the meaning of easy printed *sentences* (such as those in first readers) rather than the ability merely to recognize individual words;

(b) the ability to interpret paragraphs as wholes rather than sentences or words in isolation;

(c) interest in reading;

(d) attention-span;

(e) general intelligence.

Procedure: 1. Prepare (a) tests of word recognition utilizing first-grade vocabulary; (b) tests of sentence comprehension, sentences which cannot be interpreted by recognizing a few individual words in the sentences; (c) tests of paragraph comprehension which cannot be

interpreted by reading each sentence in isolation. (To avoid preparing tests, the Gates Primary Reading Tests may be substituted.)

2. Obtain a test of general intelligence for the primary grades, such as the Pintner-Cunningham.

3. Administer the reading tests and the general intelligence test. Combine the teachers' estimates of intelligence with the results of the test to get a composite rating for intelligence.

4. Observe each pupil in his reading activities to obtain an estimate of his interest in reading and the average duration of his attention to reading material.

5. On the basis of the combined estimates, place in one section the pupils who make high scores on the paragraph comprehension test. Place in a second section the pupils who make high scores on the sentence comprehension test but not on the paragraph test. Place in a third section such of the remaining pupils as rank high both in the word recognition test, in interests, and in general intelligence. Place the other pupils in a fourth section; namely, those who rank low both in interest and intelligence.

Comment on Findings: 1. The resulting sections proved sufficiently homogenous for purposes of instruction since the first section could practice in wide reading, the second section could be trained in coherence of interpretation, the third section could be given rather rapid training in sentence interpretation, while the fourth section was so small that individual attention

could be given to devices to develop interest in reading; vocabulary training, and other preparatory activities.

All Subjects — Fourth Grade

Problem No. 6: To divide a fourth grade into two homogeneous sections to facilitate instruction in all subjects.

Major Assumptions: 1. That success in one subject tends to accompany success in other subjects if the subjects are equally well taught.

2. That the following criteria are the most significant in relation to appropriate types of teaching (a) previous school achievement, (b) general intelligence, and (c) the teacher's estimates of the pupil's ease in learning.

Procedure: 1. Give the Stanford Achievement Test.

2. Give the Gates Reading test.

3. Give any reputable mental test.

4. Ask the previous teacher to rank the pupils on the basis of her judgment as to their relative ease in learning.

5. Section the class on the basis of the composite ranks, giving equal weight to the four criteria applied.

Comment on Findings: 1. From a total of sixty-five pupils in the grade, only nine pupils were transferred from one section to the other during the first three months following the formation of the two sections.

2. From a total of eight subjects taught, the classification proved entirely satisfactory in three. In the

remaining five subjects the difficulty of instruction was minimized by forming "study groups" within the section.

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3. Managing a Class

(Type-Problem III B)

The type of problem to which this section is devoted lies between the research problem in administration and the temporary problem in class management. The problems excluded as being purely administrative are problems relating to the cost of different methods of record making, scheduling of classes, routing of classes, and others affecting the formulation and maintenance of policies affecting the school as a whole. The problems excluded as too temporary to require investigation are problems resulting from the individual teacher's personality, the accidental composition of a given class, the circumstances that combine to produce disciplinary emergencies, and others of like nature. Between the two types of problems thus excluded lie certain problems that commonly do require investigation by service study techniques.

Problems. — Of the problems in managing the class to which service studies commonly apply, some five have been selected for discussion. The first of these involves the routinizing of teaching and learning activities that can safely be routinized without sacrificing pupils' initiative or in any way restricting the value of

instruction. In most classes at any grade level much attention must be paid to purely mechanical details such as the keeping of notebooks, the finding of references, the correction of errors, and the like. For the most part such details constitute an important part of the curriculum, since pupils must learn to attend to them efficiently as a means of attaining desired outcomes of greater importance. In the elementary grades, such matters as sharing the use of materials, waiting for one's turn, and other points of courtesy represent social values that are sufficiently important in themselves to deserve systematic teaching. When such pupil activities are routinized, they become easier for pupils to learn in the same way and to the same degree that organized subject matter is easier to learn than subject matter taught incidentally. The procedure useful here is to assemble various methods of performing the given activity, select the best method for the class to adopt (by experiment or otherwise), and then to plan ways of teaching the class to apply such methods. The methods of research that have been developed by studies of habit formation represent the most objective and reliable techniques for the study of problems in teaching. The fact that such techniques have rarely been applied to the routinizing of activities involved in class management offers plenty of scope to service studies of this type.

A second problem concerns the establishing of routines that serve to prevent or minimize problems in

discipline. Procedures have been discussed for the study of problems in motivation (II D) and effective motivation is the best single means of preventing disorder. It is none the less true that disorder results as frequently from inefficient class and school management as from lack of interest in school work, and pupils' genuine interest in their studies is by no means incompatible with the sort of horse play that is prevented by efficient routine. The analysis of conditions that invite disorder and the definition of suitable customs and regulations to control them, is thus a genuine service problem. The research techniques that have been successfully applied to the classroom conditions responsible for disorder are few. Yet the entire range of techniques employed by psychologists to define pupils' motives and to select appropriate incentives are theoretically available. The service study thus commands a wide variety of sources and techniques from which to select data concerning the activities that the administration should routinize.

A third problem concerns the scheduling, routing, and seating of pupils. Various studies have been made from the administrative standpoint to compare the results accomplished by teachers or by pupils in different periods of time. The preparation of any schedule involves certain assumptions as to the amount of time required to perform the scheduled activities. Where the time allotments are decided simply by striking an average of the time allowed in various schools, the re-

sulting schedule may be altogether unsuited to the given conditions and to the best interests of the work. It is accordingly important for the administrator to experiment with different time allotments for different school activities until the minimum time necessary has been determined. Since the methods of conducting such experiments are entirely simple, the planning of the service study seldom involves more than an examination of the research studies in this field and the selection of whatever type of study is most appropriate to the given conditions.

The routing of pupils is not a problem requiring investigation in any but very large schools or schools in which certain rooms must be used by many different classes. Since the problem usually owes its importance to the limitations of the given school plant, it has received slight attention from the research student. Yet every building supervisor has to plan the passing of pupils from room to room and most supervisors have had occasion to relieve the confusion that results when the routine is upset by irregularities in the schedule. Principals and building supervisors have thus a fund of practical wisdom that should be utilized by anyone for whom the regulation of pupils' movements about a particular building represent a serious problem.

A fourth problem to be considered involves the development of methods for the preparation, distribution, use and care of materials — such as laboratory equip-

ment, shop tools, drawing instruments, library books, pupils' papers, and other school and classroom supplies. The use to which the materials are put, the age and number of pupils who use them, the facilities for storing, and other conditions peculiar to the given school or classroom, determine the nature of the problem. It is not likely that more than a small proportion of such problems require investigation, but for those that do it is necessary to analyze the methods and select those that meet criteria suggested by the existing conditions.

A final problem that commonly deserves investigation is how to provide the facilities needed for efficient work. Certain facilities such as time, space, equipment, reading materials, and other supplies are often inadequate for the teachers' needs and no funds are available by which to make them adequate. It thus becomes necessary to make the best use of the existing facilities, which ordinarily requires some analysis of the activities involved. One frequent difficulty in high-school management, for example, is to make a sufficient variety of reading materials available for use in the classroom. Such a problem can only be met by investigating the sources from which the readings can be obtained, finding out how many of the desired references can be placed in the classroom, and then developing such regulations for the use of the references as will enable the largest number of pupils to use them efficiently.

Problems involving the accommodation of class

work to insufficient time schedules, inadequate space, and improper equipment respond also to much the same type of study. As thus outlined, the methods of adjusting such difficulties scarcely deserve the impressive term, "investigation." Yet the simplicity of the techniques whereby useful solutions are reached should not cause them to be disregarded. There is plenty of evidence to show that inadequate facilities often result in a superior product for the reason that some one has devised methods of putting the existing facilities to the best possible use. Such ingenuity is better stimulated by systematic study of the problem than by force of circumstances.

Assumptions. — Presumably more assumptions are involved in service studies of the problems mentioned than in any other of the eleven type problems discussed in this volume. The fact that any activity of management is a means to an end presupposes a knowledge of the end before an efficient routine can be defined. That is to say, before it is possible to routinize the method by which pupils shall organize materials in notebooks, it is necessary to assume that the purposes of the notebook are carefully determined and that such purposes are valid. As any administrator knows, such assumptions are by no means trustworthy, yet they must be made in order to render practicable the investigation of problems in routine. Unless it is assumed that the ends set up are valid, the problems of management revert to problems of the

types already discussed, wherein the investigator undertakes to define efficient procedures in teaching.

On this account the general assumptions to be mentioned are somewhat arbitrarily chosen from many others that are equally important. The statement of assumptions regarding the purposes of class management is the first step to the testing of the assumptions, and only as the assumptions are tested by investigation is it possible to relieve the schools of the conventional routines that serve no useful purpose.

1. As in any administrative problem, it is assumed that the courses of study and methods of teaching are wisely chosen from the standpoint of the school's objectives. This assumption serves to confine the study to the field of management.

2. It is necessarily assumed that the investigator has taken pains to validate the purposes for which the routines are desired. Such validation prevents the routinizing of activities that have greater educational value when not routinized. When it is not practicable to validate each routine, it must be assumed that educational values are not sacrificed to administrative expediency.

3. It is assumed that certain activities need to be performed so frequently by teachers or by pupils that the selection of efficient methods of performance is a matter of real importance to the organization.

4. With regard to pupils' learning activities in the classroom it must be assumed that such activities are

routinized only when a single method of performance may be established as most efficient for all pupils. This assumption tends to restrict the routinizing of learning activities to purely mechanical matters such as form of written papers, methods of keeping notebooks, and the like.

5. It is assumed that certain other classroom activities are of sufficient importance in themselves to be carefully planned and systematically taught, especially the activities involving social conventions to which refined people conform.

6. It is assumed that the physical conditions of the school plant may be made adequate from the standpoint of the educational objectives of the given school. This assumption precludes problems involving the raising of additional funds and emphasizes the problem of adapting procedures to the existing facilities.

7. It is assumed that any activity for which a routine method of performance is to be planned is carried on in other schools so that the investigator may benefit by the experience of others. Unless this assumption is made, the investigation is little more than a selection by trial and success.

8. Finally it is assumed that the investigator may count on the willing cooperation of the teaching staff in any study to formulate routines affecting the general school organization.

Type Procedure. — Since so many of the problems related to this type may be solved by one or two

simple steps, it seems best to confine the following abstract to the features most likely to require attention. The abstract is consequently briefer than most of the others. The details needed to round out the procedure for application to a problem will be suggested by the outlines of specimen studies. The abstract does not specifically meet each of the five subproblems previously described.

The Problem. To determine the activities of pupils or teachers that may safely be routinized and to define efficient methods of performing the routines.

Abstract of Procedure. a. (Optional.) Obtain by means of observation, analysis of professional literature, diaries, check-list, or interview a list of activities regularly or frequently performed by pupils in the classroom or other parts of the school premises. When such activities cannot be observed directly by the teachers concerned, they may be inferred from the assignments and subject matter of the course, or from the general program of school activities to be routinized. (See Specimen Studies, No. 1, Step 2; No. 2, Step 1; No. 4, Steps 1, 2; No. 9, Steps 1, 2, 3, No. 11, Steps 1, 3, 4, 6.)

b. (Optional.) Divide the list of activities into those involving educational values and those of a physical sort, such as distribution of supplies, seating, and the like. (See Specimen Studies, No. 8, Steps 3, 4; No. 9, Step 2.)

c. (Optional.) Check the activities of both types

against the desired outcomes or objectives of the school, department, or course and note the activities for which no legitimate purpose is evident or which are clearly objectionable. Omit these and retain the others as the pupils' activities to be routinized. Apply the following steps to one such activity at a time. (See Specimen Studies, No. 1, Steps 3, 4; No. 2, Step 2; No. 8, Steps 5, 6, 7, 8; No. 10, Step 1; No. 11, Step 1.)

1. Collect representative situations involving the selected activity and submit them to the teachers concerned, asking the teachers to add new situations of equal importance, then to rate the situations for frequency and importance. (See Specimen Studies, No. 6, Step 3; No. 8, Steps 2, 3; No. 9, Steps 1, 2; No. 10, Step 1; No. 11, Steps 1, 3, 4, 5, 6, 7, 8.)

2. Obtain from the teachers concerned and from other appropriate sources a body of methods for the efficient performance of the selected activities in the situations rated as most significant. (See Specimen Studies, No. 1, Steps 1, 2, 3, 4, 5; No. 2, Steps 3, 4, 5; No. 4, Steps 2, 3, 4; No. 7, Steps 1, 2; No. 9, Step 3; No. 10, Steps 2, 3, 4; No. 11, Steps 2, 3, 4, 5, 6, 7, 8, 9, 10.)

3. Select the more promising methods with reference to the existing conditions and direct the teachers in planning a procedure whereby the approved methods may be efficiently taught as routines. (See Specimen Studies, No. 1, Step 5; No. 2, Step 6; No. 4, Step 5; No. 5, Steps 1, 2, 3, 4, 5; No. 7, Step 2; No. 9, Steps 4, 5; No. 10, Step 4; No. 11, Step 11.)

4. Experiment with the routines as planned. Note the pupils who appear to be hampered by standardizing the activities as routines. Note also the ways in which the routine procedure may be simplified or improved by modification of certain features. (See Specimen Studies, No. 2, Step 7; No. 3, Steps 1, 2, 3, 4, 5, 6; No. 4, Step 5; No. 5, Step 5; No. 6, Steps 1, 2, 3, 4; No. 7, Steps 3, 4; No. 9, Step 6; No. 11, Step 11.)

5. Apply the foregoing procedure with necessary adaptations to the routinizing of teachers' activities instead of pupils activities when the problem involves greater standardization of teachers' procedures in school or class management. (See Specimen Study, Steps 1, 2, 3, 4, 5, 6, 7, 8.)

Type Study. — The following illustration represents the preliminary steps in a service study[1] to determine means of routinizing pupils' activities in relation to school property. The study as outlined represents the steps as planned by the administrator for presentation to the teaching staff. The remaining steps are necessarily difficult to anticipate but are comparatively simple to work out in conference with the teacher's committees.

Problem. To formulate and teach routines whereby the pupils of a given junior high school may be trained in a proper respect for public property.

Assumptions. 1. That pupils' behavior in relation

[1] Conducted by L. R. Hiatt, Principal of the Central Junior High School, Fort Scott, Kansas.

to school property represents a serious problem of school management.

2. That pupils' behavior in relation to school property may be controlled by suitable routines.

3. That the teachers of the given staff are competent to plan the routine activities involving care of school property.

4. That the staff is willing and able to teach the routines planned.

Procedure. (See the foregoing Abstract of Procedure for complete list of steps.)

Step 1

"Submit to the teachers of the grades concerned a list of situations involving pupil activities to be routinized, asking the teachers to rate the situations for frequency and importance."

The procedures organized in this step, and in the other steps as well, were presented in the form of bulletins issued by the principal's office. The first bulletin explained the need for a special study of the problem and requested teachers to report situations involving care of school property. The second bulletin follows:

Will you kindly examine the following tentative list of specific situations which have come to my attention, rate them as indicated, and return this form to the office not later than tomorrow noon.

1. In columns headed FREQUENT, IMPORTANT, and

REMEDIABLE, indicate your opinion by inserting in the appropriate squares the figures, 3, 2, or 1. Three means most, 1, least, and 2 doubtful.

2. In the column headed MOTIVES, state in a word or two what you think is the pupil-motive.

RESPECT FOR PROPERTY

Specific Situations	How Frequent?	How Important?	How Remediable?	MOTIVE
I. Destruction or damage of property				
A. Breaking windows				
1. Through playing armory ball				
2. At night				
B. Marking and cutting				
1. Toilets				
2. Corridors				
3. Pupils' desks				
4. Outside of building . .				
C. Destroying grass and flowers				
1. Cutting across lawns and gardens				
2. Taking flowers belonging to private persons, which grow near the sidewalks				
II. Messy habits				
1. Cluttering rooms, corridors, and grounds with papers, etc.				
2. Putting gum on school furniture				

RESPECT FOR PROPERTY

	How Frequent?	How Important?	How Remediable?	MOTIVE
III. Honesty habits				
A. Stealing				
1. Pupils' property				
Books				
Paper				
Pencils				
Pens				
Money				
Clothing				
Laboratory materials				
B. Returning personal property				
1. Failure to turn in to office or to a teacher .				
C. Losing personal property				
1. Failure properly to identify personal articles with initials or name. . . .				
2. Leaving personal property about unguarded, and unnecessarily . . .				

Steps 2 and 3

"Collect efficient methods of performing the pupil activities and plan ways of teaching the activities as routines."

The third bulletin is quoted to illustrate the principal's procedure in directing the teachers' formulation

of effective methods to motivate pupils' respect for school property. Such motivation was defined as the development of a desire for neatness, respect for property, and honesty.

Judging from the fact that every teacher returned the copy of Special Bulletin No. 2 promptly, and that it was carefully checked, all teachers are interested in this project.

Neatness, respect for property, and *honesty* are the pupil traits which all agree should be considered in a campaign to improve the school routine with respect to care of property.

In this bulletin I shall present briefly a teaching program for a pupil-trait. This particular teaching program is taken from *The Teaching of Ideals,* by W. W. Charters, (1927). This program is really a summary, through an application, of his entire book. The 18 items of the program appear at the left; at the right such comments as I think might point to a practical program here. Will you, as you read this, take a pencil and jot down any ideas that occur to you. Bring this sheet, with your written comments, to the conference. We shall at that time make some definite plans, looking toward putting the program into effect.

A Teaching Program For Traits

1. The faculty decides on a few traits.	This faculty has decided on neatness, respect for property, and honesty.
2. The specific situations, in which the traits apply, may be listed by a committee of teachers.	This faculty has decided upon the selection of the specific situations as set forth in *Summary of Special Bulletin No. 1,* already in your hands.

3. Typical traits applying to each situation are compiled.

This classification is also given in *Summary of Special Bulletin No. 1.*

4. Stories and pictures illustrating the successful or unsuccessful applications of the traits in specific situations, are taken from literature, history, and other sources.

It would be difficult to find in literature or history, stories or pictures illustrating the application of traits to the specific situations involved in our project. You know actual local incidents, however, involving these traits. If not, such incidents could be made up, true to life, which would illustrate the application of the trait to the specific situation. Also one can find many stories and pictures from history and literature which do illustrate the trait applied to related situations.

5. Plays and games may be constructed to illustrate in an interesting manner the application of a trait to a given situation.

To teach any trait by a play, such a play may be made by:

1. Selecting the trait to be taught
2. Selecting the situation in which the trait is to apply.
3. Determining the trait action
4. Selecting the characters
5. Determining the scenes
6. Collecting the properties
7. Determining the action and dialogs

6. Classify by grades. Each teacher should have printed material on the ideals, situations, and materials she is to work with and emphasize.

What this means is that each teacher would need to write down all the methods she developed in teaching honesty, respect for property, and neatness, to the end that her experience can be put into permanent form for further use. She should record unsuccessful as well as effective ideas used.

7. Each subject and extra-curricular activity should be examined to see what ideals are to be stressed in connection with them.

In English classes, the three traits and the specific situations could be made the basis for debates, floor talks, essays of a light informal type, and children could be asked to bring in newspaper stories, personal illustrations, poems, etc., to illustrate these matters.

In civics all these situations might be discussed in their various aspects.

In mathematics, the economic side of the results of destroying property might be basic to problems

In art classes, the marring of property could be illustrated and discussed.

And so on in every subject.

In extra-curricular activities, these traits need emphasis wherever pupils handle money or property.

8. Supplementary material should be furnished to teachers.	Whenever any teacher produces any material which would be of interest to others it will be duplicated and distributed. Likewise the office will try to secure material for distribution.

In a later bulletin you will be furnished with a continuation of Charters' Program for Teaching a Trait, which will consist mainly of methods.

PRINCIPAL.

Step 4

"Try out the plan of teaching the routines and revise."

Considering the nature of the problem, this step is largely obvious and requires no further illustration than is supplied in Chapter VI, Section 3, Observation.

Step 5

"Repeat the procedure as applied to teachers' activities instead of pupils' activities where conditions require."

This step was not taken in the study reported. The techniques involved are sufficiently illustrated by the foregoing steps.

Tabular Analysis of Methods of Investigation. — *Types of Data Pertinent to the Problem.*[1]

[1] The twenty types of data here shown are represented by their numbers in the following table. Hence each number in the table indicates a type of data that may be obtained from the source to the left of the row and by means of the technique at the top of the column.

1. List of school activities.

2. Reasons for performing the activities, i.e., objectives.

3. A series of proposed activities, constituting a most efficient method for accomplishing the objectives.

4. List of unnecessary or undesirable activities which are being performed which should be eliminated.

SOURCES	TECHNIQUES												
	Analysis	Reading and Recording	Observation	Personal Interview	Group Conference	Diary	Question blank	Check list	Time record	Experiment	Group rating	Individual Evaluation	Sampling
Pupils in the class or school			**1**	**1, 2,** 14		1	1, 2	1,2,**14**	**9, 10**	**8**			**20**
Teachers			**1**	**1, 2, 3**	1, 2, **6, 12, 16**		1, 2	1, 2, 3	**9, 10**	**8**	**17**		**20**
Supervisors				**1,2,3,6, 12, 16**			1, 2	1, 2, 3				**17**	
School officials				1,2,3,**6, 16, 18**	1, 2		1, 2	1, 2, **3**			**17**		
Authorities on teaching							3, **6, 12, 16**	**3,** 6, 12			**17**		
Parents				1, 14			1	1, **14**					
Occupational groups				14			14	**14**					
Professional literature on school management	**3, 6,** 12												
on general and special methods	3, **6, 12, 13, 14 15, 16**												
Texts and courses of study	3,**12,13, 14, 15**												
School supply catalogues	**12 ,13, 15**												
School records		1											20
Libraries, museums, exhibits	12, 13												
Local environment	13, 14												

Boldface figures indicate essential steps; others are optional.

DATA USED AS SOURCES OF OTHER DATA DESIRED	TECHNIQUES					
	Analysis	Individual Evaluation	Comparison	Classification	Organizing	Sampling
List of school activities	**2**	....	**3,4,5**	**2**	2	**20**
Reasons for performing the activities	.....	....	**3**	.....	....	**20**
Series of proposed activities considered most efficient	.....	....	**4, 5**	**4, 5**	....	....
List of necessary or desirable activities to be learned	**6**	....	....	.....	....	....
Methods for teaching efficient routines	.....	....	....	.....	**7**	....
Plan to be followed in teaching routines	.....	....	....	.....	....	....
List of time utilized in performing activity	.....	10	**11**	.....	....	**20**
Time actually required by class to perform activity	.....	10	**11**	.....	**11**	**20**
List of facilities needed in the course	**13, 14, 15**	....	**19**	**13, 14, 15**	....	....
Criteria to apply to facilities	.....	....	**19**	.....	....	....
List of facilities which may be purchased	.....	....	....	.....	....	....
Funds available for facilities	.....	....	....	.....	....	....
Pupil difficulties in the course	12	....	....	.....	....	20

Boldface figures indicate essential steps; others are optional.

5. List of necessary or desirable activities to be learned.

6. Methods for teaching efficient routines.

7. Plan to be followed in teaching routines.

8. Suggestions for improving teaching plan.

9. List of time utilized in performing activities.

10. Time actually required by class to perform activity.

11. Schedule of necessary time allotments for each activity.

12. List of facilities needed in the course.

13. List of facilities obtainable free.

14. List of facilities which might be donated by pupils, parents, community firms, etc.

15. List of facilities which may be purchased.
16. Criteria to apply to each facility to be obtained.
17. List of most helpful facilities for the course.
18. Funds available for facilities.
19. List of facilities to be purchased.
20. Valid and reliable results.

Specimen Service Studies. — Except as it serves to change the character of the activities to be routinized, the grade level has little effect on service problems of this type. *The methods of investigating* routines for the distribution of supplies, for example, are much the same whether fourth-grade or tenth-grade pupils are involved. On this account certain problems are illustrated by one study only.

Social Studies — Secondary Grades

Problem No. 1: To define efficient study methods to be habituated or routinized for a class in seventh-grade history.

Major Assumptions: 1. That the teacher's objectives are valid.

2. That the teacher is competent to select from professional literature the study methods that are most appropriate for the given class.

3. That the study methods employed by the pupils who do the most satisfactory work, and not employed by pupils who do the least satisfactory work, are the methods that should be routinized.

4. That seventh-grade pupils are able to describe their methods of study when interviewed.

Procedure: 1. Examine bibliographies appended to standard texts on the teaching of history and the social studies (especially the *Twenty-Second Yearbook of the National Society for the Study of Education*), Part II to locate specific descriptions of study methods approved by authorities on junior-high-school teaching. List each of the methods that are clearly important for the given class to adopt.

2. Interview each of the pupils in the class who are conspicuously inefficient. About five pupils of each type should be interviewed. Each pupil should be asked to describe as specifically as possible his methods of studying typical assignments and to give examples. Record what each pupil says.

3. Tabulate separately the methods used by the good pupils and by the weak pupils, showing in each case the number of times each method was mentioned by the pupils of either group.

4. Classify as desirable the methods used by at least forty per cent more of the good pupils than of the weak pupils. Classify as undesirable the methods used by at least forty percent more of the weak pupils than of the good pupils.

5. Add the methods found to be desirable to the list of methods obtained from the literature, if not already included. Construct practice exercises for use in teaching all pupils how to apply each method. In using

such exercises for drill purposes, take pains to see that the methods found to be undesirable are systematically eliminated by the substitution of more efficient methods of obtaining the desired results.

Reference: S. L. Pressey, *Adventures in University Teaching.*

Comment on Findings: 1. The procedure resulted in detecting a few extremely wasteful methods of study, such as attempting to memorize the first sentence of each paragraph assigned in the textbook. The wasteful methods were discouraged and probably eliminated by emphasis of superior methods.

2. The practice exercises used to habituate the efficient method where also useful in revealing inefficient methods used by pupils not interviewed. Many wasteful methods were used by pupils doing satisfactory work in the course.

Tardiness — Elementary Grades

Problem No. 2: To define and routinize remedial measures for persistent tardiness on the part of the three intermediate grades of a given elementary school.

Major Assumptions: 1. That proper incentives to punctual attendance must be selected with reference to the more frequent causes of tardiness in the given school.

2. That such incentives may be obtained from other principals and teachers by whom tardiness from similar causes has been checked.

3. That causes of tardiness in the given school may be determined by interviewing parents of tardy pupils, the pupils themselves, and the teachers of the pupils concerned.

Procedure: 1. Select for special study the ten pupils of each grade who have the worst records for tardiness. Interview each pupil to determine reasons for his tardiness.

2. Classify the reasons obtained in two groups; one group containing reasons beyond the pupil's control, the other containing reasons that may be removed by parents' cooperation and by applying the proper incentives.

3. Correspond with the parents of pupils who explain their tardiness by reasons beyond their control. Request each parent to name a time for a personal interview. Interview the parent for the purpose of checking the accuracy of the pupil's report and also to obtain suggestions concerning the incentives most likely to secure the pupil's prompt attendance. In addition make a plea for the parent's help in getting the pupil to school on time by presenting facts regarding the difficulties caused by habitual tardiness.

4. Obtain specific suggestions from each teacher of the grades concerned with regard to (*a*) methods of removing causes for tardiness that are beyond the pupils' control, and (*b*) incentives applicable to pupils who are tardy without good reason.

5. Obtain similar suggestions by correspondence from other principals in communities of similar type.

6. Classify the suggestions received and present them in conference to the teachers concerned. Discuss each suggestion or type of suggestion as a means of establishing the general policy to be followed. On the basis of the teachers' judgment select the suggestions or incentives considered most likely to secure the co-operation of parents and pupils. Routinize acceptable methods of recording tardiness, such as: notifying homes of tardiness, assigning penalties for excessive tardiness, granting rewards for improvement in punctuality, and the like.

7. Try out the procedures as planned and revise them in the light of experience.

Comment on Findings: 1. The most effective incentives proved to be the routines providing for the explanation of each tardiness by a pupil before he was allowed to attend classes and the routine method of posting the tardiness record conspicuously in the main hall. Before being admitted to classes, each pupil was required to wait for an audience with the principal or his representative and to explain his tardiness fully. The explanations were recorded for future use. The posting of tardiness was also effective for the reason that the emphasis placed on prompt attendance in assembly and home rooms made the tardy pupils objects of good-natured ridicule.

2. Of all the suggestions received, the most helpful

were those obtained by correspondence from other principals.

Scheduling — Elementary Grades

Problem No. 3: To estimate the time required for different units in various courses of study as a means of scheduling the work of each grade — Specimen unit; the addition of simple fractions in fifth-grade arithmetic.

Major Assumptions: 1. That the time allotted to the formal subjects in each grade should be determined by the time required by 90 per cent of the class to master each of the prescribed units.

2. That a pupil has mastered simple fractions when he is able to solve each of thirty different problems in addition, selected at random from all of the possible fraction combinations studied.

Procedure: 1. Give the class practice in the addition of fractions, distributed in four half-hour periods over the combinations prescribed for the course.

2. Follow each half-hour period after the fourth with a test containing thirty items selected at random.

3. Determine the number of practice periods necessary for 90 per cent of the class to make a perfect score in the test.

4. Proceed similarly with other units prescribed in the course.

5. Proceed similarly with courses prescribed for the grade in other formal subjects and in content subjects

where tests serve equally well to determine the attainment of the outcomes desired.

6. Calculate the total time required for each subject and base the weekly schedule for all subjects on the ratios indicated by the totals.

Comment on Findings: 1. The procedure outlined proved an efficient method of scheduling arithmetic, music, spelling, English composition, American history, and geography. The time required for reading, nature study, hygiene, and other content subjects was estimated on the basis of the standard tests most applicable to the desired outcomes.

2. On the basis of similar tests given at the end of each unit during the next year when the schedules were in force, minor adjustments were necessary in view of the changes in the teaching staff.

Routing — Secondary Grades

Problem No. 4: To schedule and routinize the passing of junior high-school classes in such manner as to eliminate confusion caused by crowding of passages and by unnecessary noise.

Major Assumptions: 1. That all classes must assemble and dismiss on a uniform schedule.

2. That stairways and other passageways cannot accommodate all pupils who must use them in order to reach departmental rooms on time.

3. That enforced silence between periods makes for too great repression during the school day and is to be avoided so far as possible.

Procedure: Prepare a blue print diagram of the building drawn to scale with specifications regarding location of departmental rooms containing apparatus necessary for efficient instruction in certain subjects, class schedules, number of pupils in each class, capacity of passageways, number of teachers, and other data essential in planning the routing of pupils.

2. Prepare as satisfactory a plan as possible on the following general principles and others obtained from articles on school management; teachers should change rooms instead of pupils whenever stationary equipment is not required, stationary equipment for instruction in special subjects (science, home economics, shop, et al.) should be placed on the same floor, courses should be so scheduled that not more than two classes need to pass from one floor to the next at any one period, intervals between classes should allow time for pupils to get seated and arrange materials needed for the class, and unnecessary talking should be eliminated by securing pupils' cooperation instead of by coercion.

3. Submit the tentative plan prepared to other teachers asking for criticism and specific difficulties anticipated. Adjust the difficulties in conference so far as possible.

4. Submit the plan together with such difficulties as are not adjusted to other principals of similar junior high-school buildings and ask for suggestions.

5. Incorporate the suggestions received and apply the plan, noting difficulties that require further study.

Comment on Findings: 1. The congestion on the stairs and in hall-ways was relieved by assigning the first period every day to the largest classes of each grade in courses that must use the stationary equipment in certain rooms. Thereafter the classes remained in the rooms and the teachers changed, except for the passage of single classes to and from the special rooms.

2. The addition of three minutes to the between-period interval made it possible for one class to leave a room before the new class was admitted.

3. The problem of unnecessary talk was automatically solved by relieving the crowding in the hallways. A further incentive to good order consisted in the appointment of pupil "traffic officers" who took their duties seriously and made the passing of lines more business-like.

Seating — Elementary Grades

Problem No. 5: To seat the pupils of each grade section most efficiently with reference to individual needs for special instruction, ability to see and hear, and ability to concentrate.

Major Assumptions: 1. That each room is filled to its capacity of thirty-five pupils.

2. That pupils most easily distracted should be seated nearest the teacher.

3. That pupils with impaired sight or hearing should be placed nearest the blackboard.

4. That pupils likely to require the same type of explanation should be seated together in order that the teacher may give such explanations or special assignments to the group rather than to each member of the group separately.

5. That a routine procedure is desired which may be applied to any typical classroom for each of the first six grades.

Procedure: 1. At the close of the school year, send a list of the pupils in each grade to all teachers of the grade, including teachers of special subjects. Ask each teacher to check in one parallel column the pupils who are most readily distracted, using a three-point scale to designate differences in ability to concentrate. Lines may be drawn to show pairs of pupils who should not be placed in adjacent seats.

2. Summarize the ratings for each grade and rank the pupils in order of increasing ability to concentrate.

3. If tests for sight and hearing are made each year, designate by a special mark the pupils below normal. Otherwise give simple group tests for sense acuity to the pupils of each grade.

4. Direct each teacher to plan the seating of each class first on the basis of mental test ratings, placing pupils of approximately the same mental age on the same vertical rows. This should facilitate explanations in each subject that are needed by pupils of different degrees of ability. Then have each teacher assign the seats in horizontal rows, commencing with the front

row, to pupils with imperfect sight or hearing, then to other pupils in order of increasing ability to concentrate.

5. At the beginning of the next school year, have the new teachers assign the seats as planned, except for the first grade in which no assignment of seats is necessary. Encourage each teacher to change the seat of any individuals when the need appears and to report any objections to the general routine of seating.

Comment on Findings: 1. While mechanical in the extreme and therefore demanding adjustment in the case of many individual pupils, this routine of seating was easy to apply and undoubtedly simplified problems of class management in most of the grade sections.

2. A difficulty was met at the outset in adjusting the height of desk and seat to the pupils assigned on the basis described. This was overcome by measuring the sitting-height of each pupil on the first day and then having the janitor, assisted by a few of the larger boys, adjust the seats and desks to the proper dimensions after school hours and on the following Saturday morning.

Obtaining Bulletin-Board Materials — Secondary Grades

Problem No. 6: To secure effective material for a bulletin board used to stimulate interest in English literature classes.

Major Assumptions: 1. That visual aids selected with reference to the interests of a particular class are

valuable means of increasing appreciations of English literature.

2. That the value of such materials depends largely upon pupils' participation in collecting, classifying, and displaying them.

Procedure: 1. Discuss the possibilities of a good bulletin board with each class in English literature, displaying certain illustrations in which the given class is certain to be interested — for example, a list of "Exciting Books and Stories that are Worth Reading." Emphasize the importance of ability to select similar interesting items as in editorial work, librarianship, and in most other literary occupations.

2. Arrange with the manual training department to construct a board of sufficient size to allow a space of at least two square feet for each class in literature.

3. Prepare from articles in the *English Journal* a list of the various types of material suitable for the board and submit it to each class. Ask each pupil to check the items he can prepare himself or obtain from other sources. Ask pupils also to add any new types of material they can suggest as having interest or publicity value for the course.

4. When materials have been submitted, have the class appoint temporary committees for the selection, mounting, posting, and discussion of the materials.

Comment on Findings: 1. While the response was better in the lower grades than in the higher, since eleventh- and twelfth-grade pupils were more critical,

the procedure succeeded in arousing considerable interest in each grade. The device of having one board with different sections for each grade served to stimulate a wholesome rivalry among the committees of each grade.

2. The check-list used to suggest the materials desired is as follows, somewhat abbreviated:

TENTATIVE CHECK LIST

1. Portraits of authors
2. Portraits of actors
3. Notices of worth-while plays
4. Maps from travel bureau
5. Pictures from travel bureau
6. Perry pictures
7. Thompson blue prints
8. Picture postcard
9. Pictures from old numbers of *The Ladies' Home Journal*
10. Pictures from *The Scholastic*
11. Pictures from publishers' catalogs
12. Pupil drawings
13. Poems written by pupils
14. Book posters
15. Spelling demons
16. Kodak pictures
17. Famous sayings
18. Book reviews
19. Rotogravure section of Sunday papers containing literary material
20. List of "Poems You Ought to Know"
21. *New York Times* book review section
22. *Boston Transcript* book review section
23. *Chicago Tribune* book review section
24. List of "Essays You Ought to Know"
25. Cartoons with literary reference
26. Model forms for written work
27. Poems by contemporary poets
28. Epigrams
29. Programs for the literary society
30. Lists of trite expressions

31. Rules governing public speaking
32. Short worth-while quotations from authors under consideration
33. Prose passages illustrating the effective use of specific terms
34. Pronunciation demons in common use
35. Good similies
36. Amusing improprieties
37. Mixed metaphors
38. Dates on which themes are due
39. Selections to be memorized
40. Roll of honor
41. Book lists
42. Graphs of results of tests
43. Graph showing time relation of authors
44. Graph showing the relation of literature and history
45. Graphs of examination scores
46. Summary of an age of English literature
47. Graph representing the plot of a play
48. Graph representing the plot of a novel
49. Words that every one should know how to use
50. Best themes
51. Theme topics
52. Lists of books most popular in certain classes
53. Suggestions concerning methods of study
54. Most necessary rules of parliamentary procedure
55. List of mythological characters that every one should know
56. Letters addressed to the class

Providing Collateral Readings — Secondary Grades

Problem No. 7: To define a procedure whereby teachers of social science may locate and provide the wide variety of reading materials necessary for unitary, no-text courses in senior high schools with inadequate library facilities.

Major Assumptions: 1. That the desired outcomes from the study of social science require practice in the selection and organization of a wide variety of materials not obtainable in collected form from any one source.

2. That classroom teachers are not familiar with the techniques necessary to locate the materials related to the prescribed units of well-organized courses in social science.

3. That the definition of the procedure whereby such materials can be obtained is essential to the development of social science courses organized on the unit plan.

4. That satisfactory units have been determined for standard courses in social science.

Procedure: 1. Prepare a list of experts in the organization of social science curricula — including college professors, specialists in the teaching of social science in high-schools, reference librarians, and secretaries of various associations interested in different social studies.

2. Consult such experts by interview or correspondence to obtain specific advice regarding sources of material, methods whereby schools may purchase or borrow the materials at minimum cost, references to previous investigations of the same type, critical and summary bibliographies in different fields of social science, together with catalogs of visual aids, devices for classification, methods of filing to be used in classrooms, and other useful data.

3. Arrange for teachers to apply experimentally the techniques for locating references on designated units and the methods of using the references in the classroom. Study the results to determine major difficulties and to define criteria of particular value to teachers in selecting references for classroom use, thereby supplementing the techniques employed by reference librarians.

4. Simplify the procedure whenever possible and organize it in the form of directions to be followed by local teachers of social science in obtaining collateral references from local sources.

Comment on Findings: 1. The following procedure was recommended for teachers' guidance in learning how to locate and provide appropriate references:[1]

a. Study the units in the course to be taught
b. Apportion the material to each unit on basis of its relative value in the course
c. Decide the number of books to be purchased in accordance with the available funds and the demands of the course
d. Study the books suitable for the course and the critical material concerning them
e. Compile a list for purchase
f. Compile a list of other books useful but not essential
g. Study sources to locate information about methods of borrowing books on the second list
h. Study information relative to the visual material useful for the course

[1] Courtesy of Miss Grace Hotchkiss, Hyde Park High School, Chicago.

i. Compile a file containing information about location of the visual material and the procedure in obtaining it
j. Study the information about maps

2. The following experts were consulted for advice regarding source materials, methods of obtaining references, and methods of using the references with pupils:

a. Professors in the teaching of social science subjects in secondary schools
b. Experts in the organization of general libraries for high schools
c. Reference Librarians
New York Library
Chicago City Library
Columbia University Library
Harvard University Library
Newberry Library, Chicago
Library of Congress
University of Chicago Libraries — General Reference Librarian, and Director of the School of Education Library
d. State School Library Specialists (Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Tennessee, Wisconsin, California)
e. State Library Extension Agents (forty-one states)
f. State University Extension Librarians
g. Local Librarian (city — town — county)
h. School Librarian
i. Secretary, American Library Association
j. Secretary, Committee on School Libraries, N.E.A.
k. Secretary, Society for Visual Education
l. Director, Dept. of Visual Instruction, Board of Education, Chicago

m. Director, Art Institute, Chicago
n. Director, Field Museum, Chicago
o. Any teacher who has had technical training in organizing material

Economizing Teachers' Time — Elementary Grades

Problem No. 8: To identify and simplify such of the teachers' routine duties as require more time than is justified by results.

Major Assumptions: 1. That the relative importance of teachers' routine duties can be estimated by their benefit to pupils or to the efficient administration of the school.

2. That when the exact distribution of the teachers' time is known, certain time-consuming activities of minor importance can be safely omitted.

Procedure: 1. Prepare a chart on which each teacher of the school may record the duties performed at ten-minute intervals throughout the school day.

2. Explain the purpose of the study as an attempt to simplify the routine work of the staff, then request each teacher to record the duties performed over a period of two weeks. Compute the total number of times each duty is recorded on the charts and use the total as an index of frequency for the given duties.

3. Classify the duties recorded and submit the complete list to each teacher with the request that each duty be marked 1, 2, or 3 (indicating "most important," "important," and "unimportant" from the standpoint of pupils).

4. Summarize the returns and transfer them to the list of duties so that each duty is followed by the total scores for both frequency and importance.

5. Present the findings to a meeting of the entire staff and have each teacher indicate the duties ranked low in importance that consume most time and that might be omitted without serious loss of efficiency. Discuss the probable consequences of omitting such duties, and record the arguments offered.

6. Obtain the advice of other principals regarding the wisdom of omitting any duties on which there is serious disagreement.

7. Refer the problem to a committee of teachers representing each of the grades or departments concerned, the principal serving as chairman to represent the administration.

8. Omit or modify the duties as recommended by the committee with reference to specified grades and note consequences of the change that may require further study.

Comment on Findings: 1. The procedure aroused the keen interest of teachers and resulted in the omission of many non-essential items of routine, such as types of record, methods of supervising the halls, and methods of checking attendance at various exercises.

2. The most important result of the study consisted in the discussion of various economies practised by

certain teachers which were adopted by other teachers with considerable economy of time and effort.

Economizing Pupils' Time — Secondary Grades

Problem No. 9: To collect for use by teachers of home economics a list of devices whereby pupils may save time in performing the routine duties of the laboratory.

Major Assumptions: 1. That a major difficulty in the teaching of cooking and clothing classes consists in training pupils to perform routine duties quickly, thereby allowing more time for the important work of the period. The routine duties referred to are those involved in preparing materials for experiment, washing and replacing dishes, cleaning the sinks and utensils, using the appropriate devices for a given operation, and the like.

2. That experts in domestic science and in the teaching of domestic science have developed efficient methods of performing the routine activities.

3. That the routines in which pupils waste most time may be identified by observing typical classes in home economics.

4. That the relative merits of short-cut methods collected may be determined by experiment in the given school and class.

Procedure: 1. Visit from five to ten local high schools having well developed departments of home economics. After making the necessary arrangements,

record the purely routine duties observed, with notes to indicate the methods of performance and the approximate time required.

2. Continue the observations until new duties cease to appear on the record, then summarize the findings and classify the duties by type.

3. Consult manuals on housekeeping, textbooks on domestic science, and experts in the various fields to discover the methods of performing each duty that are recommended as most efficient.

4. Classify the efficient methods of performance according to the duties and ask the teachers of various home economics departments to indicate which of the methods are systematically employed.

5. Summarize the returns and prepare a list of the procedures found to be most serviceable to pupils. Encourage teachers to give the list to pupils and discuss the methods until each is understood, then to require pupils to apply whichever of the methods listed for a given duty is considered the most efficient.

6. Encourage teachers to record the time required for the methods used and to select the most rapid methods for general use in performing each routine duty.

Comment on Findings: The following represents one section of the check-list as prepared for submission to other teachers of home economics:[1]

[1] Courtesy of Miss Marion Breck, Supervisor of Home Economics for the State of Delaware.

Routine Duties and Suggested Economies

I. Foods

1. Do you plan something for the first pupils who enter the room to do while the other members of the class are assembling?
   - *a.* getting out supplies
   - *b.* arranging supplies conveniently for class
   - *c.* putting material on the black-board
   - *d.* distributing utensils, supplies, etc.
   - *e.* lighting the oven
   - *f.* putting water on to heat
   - *g.* preparing ingredients for use, i.e., melting chocolate, beating eggs, preparing crumbs
2. Do you avoid using class time for detailing general housekeeping duties to special pupils by routinizing such work?
   - *a.* post list of duties for each housekeeper on the bulletin board
   - *b.* appoint housekeepers for a period of a week
   - *c.* list special duties for each class for certain days in the week
   - *d.* prepare cards or slips with directions for special duties, to be handed to specified pupils
3. Do you plan to reduce the number of dishes and utensils used, as far as is consistent with good work and attractive service?
   - *a.* when materials are combined as measured, take only one dish to supply table and put measured ingredients into the dish
   - *b.* melt the shortening for quick breads or scalloped dishes in the pan in which mixtures are baked
   - *c.* measure dry ingredients first

d. plan to measure ingredients in such order that few measuring utensils are used

4. Is the equipment stored in such places and in such a way that it is most convenient for all members of the class?
   a. low enough so that pupils can reach it without climbing on chair or other furniture
   b. the efficient kitchen is a workshop, and may be orderly although the equipment is not out of sight and although evidences of work can be seen
   c. individual equipment in desks arranged so that it is conveniently reached and replaced
   d. avoid the stacking of dishes at desks and on shelves
   e. arrange pieces of equipment so that their absence can be detected quickly
   f. avoid crowding in storage spaces
   g. place equipment which is most frequently used in nearest and most accessible places
5. Do you avoid the use of complicated equipment when simple equipment serves the purpose as well?
   a. justify the use of the double boiler with the handling and washing of two pieces of equipment
   b. one meat chopper used for cheese is easier to wash than a number of graters, or chopping boards and knives
   c. use crushed oiled paper in place of a pastry brush
6. Have you simplified the personal equipment of the pupils so as to facilitate getting ready for class work?
   a. select a pattern for the apron which eliminates all buttons or tapes to be tied
   b. paper towels instead of individual hand towels
   c. caps, if used, of such style that they can be adjusted quickly, and will stay in place

7. Do you use time-saving equipment wherever possible and practical?
   a. meat chopper
   b. efficient style of can opener
   c. knives for special uses
   d. soap chips for washing dishes
8. After laundering and daily care of dish towels has been learned do you have pupils devote a minimum of time to care of dish towels after each lesson?
   a. send towels out for laundering
   b. if money is not available for laundry bills, let pupils develop skill on a familiar problem, or develop a new skill in the preparation of some product to be sold, and the money used for the laundering of towels outside of class
   c. get an appropriation of money sufficient to cover cost of laundering
   d. let pupils take towels home to be laundered.
9. Do you have ingredients to be measured arranged so that they are conveniently available for all members of the class when needed?
   a. put ingredients in containers large enough to enable measuring to be done quickly
   b. measure beaten egg by "spoonfuls" rather than by "parts" of an egg, if recipes are divided
   c. check supplies to assure that there are enough for the entire class
   d. have all supplies on hand at the beginning of the class period
   e. use tea cart or table on wheels for assembling supplies and utensils, and for making them convenient for the pupil.

10. Have you emphasized good habits of work by careful instruction in details early in the course, and continued supervision to avoid lapses until good habits are formed?
    a. insist on careful following of directions as given
    b. keep working surfaces in order
    c. dovetail rinsing and stacking of dishes, in preparation for washing them, with steps in food preparation
    d. if sinks are conveniently placed, let pupils wash dishes as the work proceeds.

Cheating — Elementary Schools

Problem No. 10. To prevent or eliminate cheating by pupils of grades 4 to 6 in informal classroom tests.

Major Assumptions: 1. That the causes of cheating are either lack of desire to be honest, a conflict between honesty and the desire for good marks, or failure to consider cheating dishonest.

2. That if the causes are discovered, training should follow the suggestions given in Charters, *The Teaching of Ideals.*

Procedure: 1. Have teachers discuss the meaning of honesty with their classes, thus learning pupils' reactions to the question whether or not honesty applies to school tests.

2. Assign the topic to be prepared — "Why pupils cheat in examinations"? to secure additional information from pupils.

3. Interview flagrant cheaters to find whether they really desire to refrain from cheating.

4. Diagnose the difficulty from the three steps, and plan appropriate remedial measures by selecting such of Charters' recommendations as most directly apply.

Comment on Findings: 1. The diagnosis revealed quite plainly that most of the cheating resulted from blind imitation of a few pupils who were largely ignorant of the dishonesty of the practice. Other motives, of course, were present.

2. The most successful treatment consisted in presenting a variety of conduct problems, some involving situations on the playground, business office, and elsewhere, while others involved classroom situations. Each pupil was asked to explain how he would meet the situation, and the relationship between dishonesty and cheating on tests was thus clearly emphasized.

Selecting Guidance Procedures — Elementary Grades

Problem No. 11: To meet the needs for pupil guidance in the intermediate grades.

Major Assumptions: 1. That pupils requiring special treatment have been identified and have been placed in sections providing as nearly homogeneous groups as is possible and desirable. (See Type Problem III A.)

2. That the purpose of guidance in the elementary school is so to administer the various types of pupils that they may all develop effective modes of reaction to the universal and common elements of the elementary curriculum. This purpose is to be contrasted with that of the secondary school where wider differen-

tiation in curricula is desirable to provide for wide differences in intellectual, social, and vocational abilities and needs.

Procedure: 1. Obtain a list of the pupils who require special treatment together with records of their reactions to the diagnostic tests administered.

2. Consult professional literature on guidance and case studies of mal-adjustment, recording the types of information found helpful by other investigators.

3. Have the teachers observe each of the pupils, recording play activities, the subjects of conversation, the material read voluntarily, apparent interests in and attention to various school activities, and other indications of specific interests.

4. Supplement No. 3 by a study of pupils' reading habits, play habits, habits of work in various school subjects, and other significant types of information as recorded in 2.

5. From a study of professional literature record desired outcomes from the common elements of the curriculum for the intermediate grades.

6. Supplement 5 by asking teachers to analyze the reactions of the best pupils in these grades. From this analysis and from their previous experience add any additional outcomes considered to be desirable.

7. Check the recorded behavior of the mal-adjusted pupils against the desirable outcomes listed in 6, thus discovering specific difficulties in adjustment.

8. Seek to determine the causes of the specific diffi-

culties through interviews with pupils, parents, teachers and playmates.

9. Collect methods for overcoming specific difficulties from professional literature.

10. From the analysis of the pupil's interests seek for the interests that may be used to motivate the desired modes of behavior.

11. Select for trial the procedures that appear to make for success and that are easily introduced. This will probably mean that the techniques for pupil guidance are first tried with a few pupils until the success of the procedures is assured. If unsuccessful, other procedures are tried, while if the first are successful the plan is further developed by introducing additional procedures for trial.

Comment on Findings: 1. Desirable outcomes were more easily obtained in the fields of arithmetic and reading than in the other school subjects.

2. Difficulties were more commonly due to specific bad habits formed early in the learning process than to any other cause.

3. The use of the child's interests was found to be an effective drive for the guidance program adopted.

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CHAPTER VI

GENERAL TECHNIQUES

As outlined in the Table of Contents, this chapter describes some fifteen general techniques in greater detail than they are described elsewhere. The techniques described are those shown by the tabular analyses of the preceding chapters to apply to a majority of the type problems.

The description of each technique is intended to explain how it is most efficiently applied to the problems already discussed. The techniques are mentioned at three points in Chapters III to V; namely, in the type procedures supplied for the type problems, in the type studies that illustrate the procedures, and in the specimen studies. Yet to one not experienced in the use of a given technique, the brief directions and examples supplied in the previous chapters take too much for granted regarding the student's ability to overcome the various technical difficulties involved. The following sections accordingly undertake to anticipate and remove the difficulties most commonly met in applying each technique.

To accomplish this purpose, each technique is developed according to a somewhat uniform plan. The

plan of development is indicated by the following topics: (a) *general purpose* of the technique in service studies; (b) *types of data* to which the technique may be applied; (c) *specific uses* of the technique for problems of different types; (d) *criteria* useful in selecting appropriate uses or methods of applying the techniques; (e) *procedure* outlined; (f) *references* to studies in the present volume wherein the technique is applied; and (g) *bibliography*, wherein the technical principles involved may be studied more intensively.

As might be expected, the elements common to various techniques make for some repetition when each technique is developed separately. "Analysis" of the objectives of a given course, for example, may involve "reading and recording," "observation," "personal interview," "group conference," "diary keeping," and the use of a "question blank" to collect the specific outcomes of instruction with sufficient completeness. Having thus collected the possible outcomes, the student might employ a "check list" or other technical device to evaluate them in order to select the more desirable outcomes. He would then need to "classify" the specific outcomes with reference to the major objectives before the analysis would be complete. It is thus apparent that the technique of "analysis" may involve many others.

The foregoing illustration undoubtedly makes the overlapping among techniques appear greater than it actually is, since "analysis" is a comprehensive process

and not all of the techniques related to it need be used in a single study. Yet the interrelationship among the techniques is so close that one must clearly recognize the dependence of one technique upon others before an investigation can be wisely planned and successfully carried out. Hence overlapping among the following sections has the important advantage of making the interrelationships explicit. To treat only the techniques that can be isolated would tend to conceal certain technical problems that are often troublesome in actual investigations.

Experience has shown that the following sections are best used as a means of interpreting the directions supplied in the type procedures of Chapters III to V. If, for example, such a direction as "evaluate pupils' learning activities by means of a check list" is not entirely clear, the appropriate sections of the present chapter may be consulted for more detailed advice in constructing the check list, in selecting those to whom it is addressed, and in interpreting the returns. When a particular investigation is being planned, it is helpful to consult the tabular analysis of the type problem most nearly resembling the actual problem. The techniques shown in the tabular analysis may then be located in the present chapter and planned with reference to the actual problem in the light of the recommendations offered.

For more advanced students, the bibliography should supply principles that can be applied to the procedures

outlined in the text as a means of defining new techniques.

1. Analysis

The techniques of analysis, classification, and evaluation together involve the essential steps of any service study. They may consequently be described as major techniques. For this reason each is treated at somewhat greater length than the other minor techniques of the present chapter. Furthermore, the three major techniques may be closely interrelated in a given study.

General Purpose. — The purpose of any analysis is to discover the elements involved in any type of data. As applied to data concerning the process of learning and teaching, analysis usually means the discovery of important implications that are not apparent to the critical observer. Thus the difficulty of a particular textbook is analyzed by finding out what proportion of the words which it contains are unfamiliar to a majority of the pupils in a given class. Pupils' abilities in a particular type of work may be analyzed by discovering the nature and frequency of the errors made by each member of the class. The purpose of analysis may be defined as the collection of specific items implied in the given data.

Types of Data. — Any type of data may be analyzed. Hence the practical questions confronting the investigator are whether the given data require analysis and,

if so, to what extent. The mechanical listing of implications that are apparent to any thoughtful student of the field represents a waste of effort that is all too frequent in educational literature. It is also true that analysis may defeat its purpose if carried too far. While to specify the *significant* implications of the data may help to understand them, it may prove highly confusing to specify *all* the implications. The analysis of any type of data must thus be kept within proper bounds. The desirable extent of analysis is determined by the nature of the problem and by the discrimination of the persons by whom the data are used.

A summary of the types of data requiring analysis, as shown in the Tabular Analyses of Chapters III-IV, reveals some twenty specific types. These types are not listed here for the reason that many of them are analyzed in the same way and may be readily combined for sake of perspective. The following table reveals nine major types of data which may require analysis.

MAJOR TYPES OF DATA IMPLIED IN TEACHING WHICH MAY REQUIRE ANALYSIS

1. Activities and problems of adults in real life
2. Information concerning adult life activities and problems
3. Data selected as important for pupils to learn
4. Pupils' activities and problems in learning the data selected
5. Information concerning pupils' learning activities and problems

6. Data selected as important for teachers to learn
7. Teachers' activities and problems in helping pupils to learn
8. Information concerning teachers' activities and problems
9. Data selected as important for further investigation

Specific Uses. — Four types of analysis are distinguished in the master list of techniques (page 66); namely, unsystematic, systematic, standardized, and statistical analysis. Inasmuch as each type is useful under appropriate conditions, the uses may be explained by describing the conditions to which each type is appropriate.

Since the types are mentioned in order of increasing difficulty to apply, it is, of course, always sensible to use the easiest type that will give the desired results, proceeding with the more difficult types only when the easier prove unsatisfactory.

Unsystematic analysis is simply a term for the ordinary process of thinking whereby anyone reads concrete meanings into a somewhat general idea. It is no more technical than any reflective thinking in the face of a problem. This type of analysis is used by every teacher to some extent in any situation that is in any way perplexing — as in breaking up a lesson into different learning steps, finding examples to illustrate a general fact or principle, or in deciding what motives are responsible for the behavior of individual pupils.

Systematic analysis differs from ordinary reflective

thinking in that the elements into which the general idea is broken up are not sufficiently known to the investigator and hence must be obtained from outside sources. A teacher may know in a very general way that certain pupils in a class have more difficulty with the work than others. The nature of the specific difficulties confronting each pupil, however, can only be determined by systematic analysis of the pupil's behavior. This involves the collection of specific difficulties as revealed by pupils' test papers, as reported by other teachers, as noticed by observing the pupil at work, and as obtained from any other sources that are equally reliable and accessible. Systematic analysis should thus be applied to the study of any type of data that requires more intensive analysis than the investigator can make off hand.

Standardized analysis differs from systematic analysis in that the investigator undertakes to make the analysis complete. Completeness is to some extent a relative term, depending upon the degree of detail to which the analysis is carried, hence it is clear that some standard of completeness is needed. Of the various standards available, perhaps the most satisfactory for service study purposes is the point at which *new items* cease to appear when a number of items are successively obtained from the same sources. For illustration, assume that the investigator wishes to obtain a complete list of the desirable outcomes of instruction in ninth grade civics, that the outcomes

are to be stated in terms of pupils' abilities to apply the principles of the course to social situations arising within the school, and that the desirable outcomes are to be obtained from the teaching staff. The procedure here would consist in comparing the outcomes reported by each teacher separately to discover when new outcomes ceased to appear.

For example, the outcomes reported by the first teacher would all be "new" ones because all were reported for the first time. Those reported by the second teacher would probably contain some that had already been reported by the first teacher and also others added by the second teacher. The other teachers would similarly report some "old" and some "new" outcomes; but after the reports of about five teachers have been checked, the number of new outcomes reported by succeeding teachers would be very small. Completeness would thus be established sufficiently for practical purposes when the reports of the remaining teachers of the staff fail to add any new outcomes to the list of those already reported.[1]

The items as reported would be listed to the left of a cross-section table. The different teachers would appear at the top of the columns. Each column would contain checks to show what items are reported by each teacher. Each column may thus be totaled to

[1] See the Table in Charters and Whitley, *An Analysis of Secretarial Duties and Traits*, p. 132, for an illustration of a form to facilitate the comparison of successive reports.

show the number of old items and new items reported by each teacher.

This method of checking the completeness of any analysis may be used also when the data are obtained from more than one source. If desired outcomes, for example, had been obtained from parents, school principals, professional literature, and experts in the teaching of civics, each source could be exhausted by the procedure described and then the sources could be similarly checked against each other.

The types of data to which standardized analysis applies may be identified by the need for completeness. Hence the specific uses of this form of analysis are defined in terms of data that are not useful unless the elements are completely determined.

Statistical analysis as such is seldom required in the type procedures outlined for the various service problems discussed in this volume. For this reason the uses of statistical analysis do not need to be elaborated. Analysis by means of statistical formulas differs from standardized analysis in that its use is largely confined to purely quantitative data. Unless the data can be represented by figures, it is not possible to determine by statistical treatment what factors are implied. For example, assume that the teacher of a sixth grade class wishes to analyze the pupils' difficulties in civics as related to difficulties in silent reading. The problem consists in measuring the relationship between success in civics and success in silent reading. If the pupils

who have least difficulty in silent reading are also those who have least difficulty in civics and vice versa, the relationship of silent reading ability to success in civics would be established. Hence the desired analysis is accomplished by finding the coefficient of correlation between the pupils rated with reference to their success in civics and the same pupils rated with reference to their silent reading ability.

The numerous texts describing the meaning and use of statistical procedures for the analysis of educational data present a variety of specific uses for this technique. Since only the more elementary procedures are involved in typical service studies, it seems unnecessary to carry the description further.

Criteria. — The more useful criteria for the success of any analysis are implied by the types of analysis mentioned. The important quality of unsystematic analysis is its simplicity. Hence *simplicity* is a criterion for this technique. It has few other qualities to recommend it.

Whether systematic analysis is effective or not depends, of course, upon whether the desired implications of the data are secured. The analysis is successful to the extent that it accomplishes the particular purpose for which it was made. Hence the criterion to be applied is its *adequacy* when used in the given study.

Standardized analysis, as already stated, undertakes to identify *all* the implications of the data. Hence the criterion here is *completeness*.

Statistical analysis differs from the other types in that it may be applied by other investigators with similar results. Hence this technique is more reliable than the other types of analysis. *Reliability* is thus a criterion for its effective use.

Simplicity, completeness, adequacy, and reliability taken together serve to suggest the important features of analysis as such. They may be regarded as criteria by which the value of any analysis may be judged. These qualities also are useful in deciding which type of analysis is most useful for a given type of data.

Procedure.—The following major steps are intended to be typical and hence useful for reference in planning service studies. They apply to the types of data that most frequently require analysis. The procedure is also designed to compromise between the accuracy demanded by intensive research and the simplicity that is needed if the teacher is to analyze the data concerning a given service problem. Since the minor techniques described in following sections are also useful in making such analyses, the procedure is rather a general outline to be filled in by such minor techniques as may be appropriate in the given study.

1. The first step in any analysis is to define the particular purpose to be served by it, since the purpose determines the appropriate type of analysis to be used. If the study requires an analysis of the subject matter of a given course, for example, one must specify what elements are desired — whether fundamental principles,

illustrations of the principles, methods of learning the principles, applications of the principles to the pupils' life experience, or other elements. The cardinal principle in making any analysis is to deal with only one element at a time. Confusion often results when the attempt is made to define two or three useful elements simultaneously. If the course material is to be analyzed into useful illustrations, then only illustrative situations should be obtained in the first treatment of the data. Other useful elements implied in the same data may then be analyzed later in turn.

2. Having decided upon the type of implication or element to be analyzed, the investigator has next to determine the sources to be used. Illustrations for a given course of study, for example, may be obtained from textbooks, from articles and books on methods of teaching the subject, from experienced teachers, from pupils, from parents, from popular literature, from observation of life activities and everyday situations related to the subject, and from various other sources as well. Some of these are clearly more productive and accessible than others. Hence only the individual conducting the service study can decide with reference to the particular problem and the local conditions what sources are best.

It is a good rule to consult first the source that appears most likely to yield large returns. The nature of the source will then suggest the more economical methods of collecting the desired data. In the example

just used, it is likely that books on special methods of teaching the subject might be selected as the first source to be consulted. In this case one would have merely to read and record the illustrations mentioned with reference to different topics of the given course of study. It would then be well, perhaps, to investigate some of the personal sources before making a more thorough canvass of the literature.

The procedure in treating the personal sources depends upon the number of qualified persons available. When the number is not too large, the recorded personal interview in unquestionably the best means of securing the data desired, whether these be illustrations for a course of study or any other ideas in the minds of the persons consulted. When the number of persons is too large to be interviewed individually, the question arises whether it is better to select representatives of the group to be interviewed or to approach each one by correspondence. A safe compromise here is to interview a selected group first in order to obtain their suggestions in greater detail than would be possible by correspondence. These suggestions then might be organized in the form of a check-list to be mailed to other persons who are asked to supply omissions. Occasionally a group conference is an economical substitute for the personal interview, but only when the group is sufficiently interested in the problem to talk freely and to keep to the point. In case no personal contacts at all are conveniently arranged, it is often

effective to persuade the individuals to keep diaries or other records of the desired data.

3. When the suggested procedures have been applied to the more promising sources, the next step is to organize the returns in such form as may be most convenient for use. A collection of effective illustrations, for example, would naturally be classified with reference to the points to be illustrated, then sub-classified, perhaps, with reference to the types of pupils to whom the various illustrations are most likely to appeal.

4. Having organized the illustrations in convenient form it remains to check the value of the analysis. The most obvious kind of check is an experiment under normal classroom conditions when the nature of the data permits. In the case of the list of illustrations for a given course of study, the experiment might consist in submitting the list to various teachers of the subject, asking each to use the illustrations with different classes and to evaluate each illustration on the basis of the pupils' response. This would serve to check the adequacy of the analysis. A second check that applies to analyses representing a large amount of specific data is the method of checking the completeness of the analysis, described on page 490 ff.

References. — Examples of analyses may be found in the following type studies and specimen studies:

Defining Objectives. Type Study, Steps 3, 6; Specimen Studies, No. 1, Step 2; No. 3, Steps 1, 2; No. 4, Step 1; No. 5, Steps 2, 3; No. 7, Step 4; No. 9, Step 4.

Constructing or Reorganizing the Course. Specimen Studies, No. 4, Steps 2, 4; No. 5, Step 2; No. 8, Step 5.

Selecting Text Materials. Type Study, Steps 1, 3; Specimen Studies, No. 5, Step 2; No. 6, Step 1.

Adapting Prescribed Materials to a Given Class. Type Study, Step 2; Specimen Studies, No. 1, Steps 2, 3; No. 4, Steps 3, 4; No. 5, Steps 1, 3, 4; No. 7, Step 1; No. 8, Steps 1, 2; No. 9, Step 1; No. 10, Step 2.

Selecting Learning Procedures. Type Study, Steps 1, 3; Specimen Studies, No. 1, Step 2; No. 2, Steps 1, 3; No. 3, Steps 3, 4; No. 4, Step 2; No. 5, Steps 2, 4, 5; No. 6, Steps 1, 3; No. 7, Step 2; No. 8, Steps 1, 3; No. 9, Step 3.

Constructing Exercises and Direction Sheets. Type Study, Steps 2, 2a, 3; Specimen Studies, No. 1, Step 1; No. 2, Steps 1, 3; No. 3, Step 1; No. 4, Steps 1, 2; No. 5, Steps 2, 3; No. 6, Steps 1, 4; No. 7, Step 3; No. 9, Step 1; No. 10, Step 1; No. 11, Steps 1, 2.

Motivating. Type Study, Step 4; Specimen Studies, No. 1, Step 2; No. 2, Steps 4, 5; No. 3, Steps 1, 4, 5; No. 6, Step 2; No. 7, Steps 1, 4.

Testing. Type Study, Steps 1, 2, 3, 4, 5; Specimen Studies, No. 1, Steps 1, 5, 6; No. 2, Steps 1, 4; No. 3, Step 1; No. 4, Steps 2, 3; No. 5, Steps 1, 2, 3, 4; No. 9, Step. 1.

Grading and Sectioning Pupils. Specimen Studies, No. 1, Steps 1, 4; No. 3, Step 1.

Managing a Class. Specimen Studies, No. 1, Step 1; No. 7, Steps 3, 4; No. 9, Step 3; No. 10, Steps 2, 3; No. 11, Step 3.

Bibliography

The readings appended to each of the sections of this chapter are similar to those of the following list. Each contains discussions of principles involved in the techniques treated by the section, together with studies that illustrate applications of the technique.

ATKINS, R. E. — "An Analysis of the Phonetic Elements in a Basal Reading Vocabulary," *Elementary School Journal*, XXVI (April, 1926), 596-606.

CHARTERS, W. W. — *Curriculum Construction*, Part II, Macmillan, 1924; *The Teaching of Ideals*, Macmillan, 1926; *The Commonwealth Teachers Training Study*, Chapter I, University of Chicago Press, 1929.

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FLEMMING, C. W. — "A Detailed Analysis of Achievement in the High School," *Contribution to Education, No. 196*. Teachers College, New York, 1926.

LUNDBERG, G. A. — Social Research, Chapter IV, Longmans, Green and Co., 1929.

MONROE, W. S. — *Techniques of Educational Research*, 28-30. University of Illinois, Urbana, 1928.

WESTAWAY, F. W. — *Scientific Method*, Chapter XIX, "The Analysis of Phenomena."

2. Reading and Recording

The investigation of any problem that is not entirely local or personal requires some reading. Even in the study of a purely personal matter, one's first act is usually to familiarize himself with what has been written on the general topic. It is obvious that

methods of selecting and recording the significant data are to a large extent determined by the habits and preferences of the individual reader. Yet there are certain ways of systematizing the reading and recording of other types of data that are useful to any investigator and that may be briefly described.

General Purpose. — The single purpose of reading to collect data on a given problem is, of course, to select the relevant data from those that are irrelevant. The difficulties in making this selection arise from the fact that while the literature related to a given problem is often abundant, the data directly pertinent to the investigator's needs are scarce and fugitive. Furthermore, the distinction between items that directly apply to the given investigation is seldom clear cut. The books that are examined seldom make the particular distinctions that the investigator wishes to make. The discussions that do apply shade off into discussions that do not apply, and the latter must be excluded as systematically as possible.

Types of Data. — From the Tabular Analyses of Chapters III to V some seventeen types of data are noted that may be obtained by reading and recording appropriate literature. It is, of course, true that something may be found in the literature concerning all types of data that appear in the master list. The seventeen types are selected for emphasis because they are often obtained as adequately and as readily from literature as from any other source.

For convenience in describing them, the data obtainable from publications may be combined into three groups. The first includes specific facts of the sort desired — such as the titles of textbooks or tests for a particular subject as found in publisher's catalogs and bibliographies, items of school equipment as found in supply house catalogs, topics related to a given course as found in published courses of study, and particular facts or exercises as found in textbooks.

The second group includes more general data such as activities, problems, and methods of learning that may or may not apply to the given class; statements concerning pupils' interests, needed skills, and abilities; suggestions for school and class management, and activities, problems, and methods of teaching. Such data are commonly found to best advantage in special methods textbooks written for teachers and in the reports of research on related problems. Technical reports and monographs have the advantage of presenting findings in the form of lists and tables that make the desired data much easier to find.

The third group of data is still more general and represents the principles, arguments, and points of view to be found in popular literature or in professional literature that is purely theoretical.

Specific Uses. — As may be inferred from the three groups of data, there are at least three uses for reading and recording that are somewhat distinct. The first of these is to prepare lists or enumerations of data be-

longing to one category, as in preparing a check-list. For example, in a study to define objectives it may be desirable to prepare a list of the specific outcomes considered important by writers on methods of teaching a given subject. Or it may be useful to prepare a list of personal traits, reading habits, mechanical skills, or other desired outcomes of a more specific character. Such items are readily recorded for later evaluation because they commonly consist of separate words or phrases.

A second typical use for the technique of reading and recording is to collect teaching materials. It is evident that in selecting exercises, passages, or chapters from textbooks, the mere length of the items prevents any mechanical check on the completeness, reliability, and validity of the selection. If, for example, one examines magazine articles and fiction for vivid illustrations of political injustice, it is quite likely that another teacher might make a different selection from the same material. Hence, it is important to define the basis for selection somewhat rigidly to make it reliable. The basis may be defined by limiting the illustrations to pictures, to anecdotes, to different occupational groups that suffer injustice, or to other types of data that can readily be identified in the reading.

A third use of the technique applies to data of still greater generality, as in selecting suggestions regarding teaching procedure. Almost any service problem involves the collection from literature of specific pro-

cedures that apply to troublesome situations. Hence in selecting such procedures it is desirable to formulate rules that may be used to exclude all suggestions that are not strictly relevant. Such rules may control the definiteness of the suggestions to be recorded, the form of statement, the evidence on which they are proposed, and similar considerations that serve as useful criteria.

Criteria. — The criteria found most helpful in recording pertinent data contained in the literature are *completeness* and *reliability*.

Completeness is an important consideration whenever the bulk of the desired data must be obtained from literature. For example, in a recent study it was desired to determine the different kinds of school reports which experts in school administration recommended as essential to efficient school management in the intermediate grades. Having selected the experts to be consulted the investigator had to make sure that all kinds of school reports mentioned in the literature were identified. The completeness of the list of reports obtained from the literature was in this case checked against a list of reports obtained from representative schools. It was found that the literature mentioned no report not obtained from the schools and that many types of report made in the schools were not mentioned in the literature. Hence it was concluded that the literature was by no means complete in this respect.

Reliability is a criterion that is far less important

in the service study than in research. That is, it makes less difference whether two or more investigators obtain the same data from the same sources than whether the data that are obtained are found useful to each in meeting their service problems. Reliability, however, is important in the service study in that data obtained from the literature should not be capriciously selected by a given teacher, as would be the case if only the suggestions were recorded which appeal to the teacher as being convenient to apply. In case of doubt regarding the reliability of the selection from any given type of literature, the most satisfactory check is to have the literature examined by several competent persons representing widely differing points of view.

Procedure. — The entirely familiar process of reading and making notes may be analyzed into four major steps as a systematic technique for selecting data of specified types from the literature.

1. The first step is to locate the reading materials most likely to contain the data desired. To this end the procedures commonly employed by reference librarians are useful. These consist in turning to a reference manual prepared for the special field in which the more important bibliographies and other sources are mentioned and annotated. The appropriate bibliographies may then be examined and supplemented by other sources referred to by the individual writers. For most practical purposes the Reader's Guide is an adequate means of locating pertinent articles in popular

magazines. Detailed treatment may be found in professional bibliographies.

In dealing with the literature on teaching this method of collecting sources is simplified by the many bibliographies prepared with special reference to problems and phases of school work that are comparatively narrow in scope. The *Bibliography of Bibliographies*, prepared by W. S. Monroe of the Bureau of Educational Research, University of Illinois, contains many examples of these. The Education Index published by the H. W. Wilson Company is an excellent index of periodical literature on teaching. It is thus an easy matter to locate the various types of books and articles that apply to a given problem. The chapter references and bibliography of any appropriate professional textbook is also likely to suggest the range of literature that is relevant.

2. When the appropriate types of literature have been located, the next step consists in selecting the particular books to be read. This is sometimes a difficult task on account of misleading titles and annotations. Furthermore, there is doubtful economy in scanning a large number of books to obtain data on a particular point that may be cleared up at once by corresponding with the authors themselves or by other methods equally direct.

Two procedures have been found useful in this connection. One is to select a small number of authorities in the particular field who may be requested to specify

sources in which the desired data may be found to best advantage. The other procedure is to correspond with research bureaus of the better known schools of education, state departments, and local institutions to request the titles of any studies that are known to bear directly upon the given problem. The scope and character of the problem will usually determine which of these procedures is preferable.

3. In selecting the desired data from the particular books and monographs, the form of the record will depend upon whether the sources are rigidly or loosely organized. That is to say, it is best to record the data in the form employed by the author whenever this form is sufficiently brief and definite. Most textbooks for teachers, textbooks for pupils, and scientific monographs are rigidly organized. It is thus often possible to select facts, principles, problems, titles of units, methods of teaching, learning abilities, and similar types of data from the chapter and paragraph headings, chapter summaries, or lists already prepared by the author. Wherever the organization of the text permits, it is thus desirable to record only the data that are presented by the author in one or more of these typographical forms. Chapter and paragraph headings, for example, are usually self-explanatory, brief, and readily classified. Hence, it is easy to check the completeness and reliability of data recorded in these forms.

4. In selecting data from popular literature that

contains no aids to the reader — such as italicized and boldface headings, summaries, and the like, it is necessary to decide somewhat arbitrarily upon the kind of record to be made. The type of fragmentary notes commonly made by college students have the disadvantage of being incomplete and difficult to classify as distinct items. It is consequently advisable to decide upon a type form of statement into which the suggestions found in the running text may be translated — such as participial phrases, substantive clauses, and the like. Examples of such forms will be found throughout the present volume whenever data are shown in lists.

References. — Examples of reading and recording may be found in the following type studies and specimen studies:

Defining Objectives. Type Study, Step 1; Specimen Studies, No. 1, Step 2; No. 2, Steps 2, 3; No. 3, Step 1; No. 4, Step 1; No. 5, Step 3; No. 7, Step 4; No. 8, Step 1; No. 9, Step 2.

Constructing or Organizing the Course. Specimen Studies, No. 2, Step 2; No. 4, Step 2; No. 8, Step 2.

Selecting Text Materials. Type Study, Step 3; Specimen Studies, No. 1, Step 2; No. 2, Step 4; No. 5, Step 5.

Adapting Prescribed Materials to a Given Class. Type Study, Steps a, 2; Specimen Studies, No. 5, Steps 1, 3; No. 6, Steps 2, 3, 4; No. 8, Steps 1, 2.

Selecting Learning Procedures. Type Study, Steps 1,

3; Specimen Studies, No. 1, Step 3; No. 2, Steps 1, 3, 6; No. 3, Step 3; No. 4, Step 2; No. 5, Steps 2, 4, 5; No. 6, Steps 1, 3; No. 7, Step 3; No. 8, Steps 1, 3; No. 9, Steps 3, 4.

Constructing Exercises and Guide Sheets. Type Study, Steps 3, 4; Specimen Studies, No. 1, Step 1; No. 2, Step 3; No. 3, Step 1; No. 4, Steps 1, 2; No. 5, Steps 1, 2, 3; No. 6, Steps 1, 4; No. 9, Steps 1, 3; No. 10, Step 1.

Motivating. Type Study, Steps 3, 4; Specimen Studies, No. 1, Step 2; No. 2, Steps 4, 5; No. 3, Steps 1, 4; No. 6, Step 2; No. 7, Step 1, No. 8, Step 4.

Testing. Type Study, Step 1; Specimen Studies, No. 1, Steps 1, 4, 6; No. 4, Steps 1, 3; No. 6, Step 1.

Grading and Sectioning Pupils. Specimen Studies, No. 3, Step 1; No. 4, Step 4.

Managing a Class. Type Study, Steps 2, 3; Specimen Studies, No. 1, Step 1; No. 9, Step 3; No. 10, Steps 2, 3.

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3. OBSERVATION

The technique of observation, as employed in service studies, is a compromise between purely objective measurement and the casual observation that any teacher must make of the factors involved in a problem. Since observation may be refined to any desired degree of accuracy, it is essential to decide how much precision is necessary in recording the data observed. Other techniques treated in other sections of this chapter that are involved in systematic observation include reading and recording, sampling, comparison, use of check-lists, experiment, testing, and individual evaluations. The extent to which these other techniques are employed in making the observations depends upon the degree of accuracy required.

General Purpose. — Observation is necessary in collecting or interpreting any data that have not previously been recorded by other observers. The Tabular Analyses of Chapters III to V show that observation is involved to some extent in the type procedures of all of the service problems treated and that the data are largely obtained from observation of pupils and of the community environment. Hence, the major purpose of observation in the conduct of service studies is to obtain significant data regarding the members of

one or more classes and regarding the conditions of the given community that help in investigating the given problem.

Types of Data. — A list of the different kinds of data that may be obtained by observation includes virtually all sources except literature. Even in the treatment of data obtained from literature, observation is usally necessary as a means of applying the data to the specific conditions of a given class or school. Hence it would be unnecessarily tedious to present such a list here. The reader will obtain a more helpful notion of the data from the column headed "observation" in the tabular analyses. It will there be noted that problems in motivation involve a larger number of references to observation than problems of the other types covered by the tabular analyses.

Specific Uses. — As already remarked, observation is necessary, and therefore most useful, in obtaining data at first hand — as in deciding whether or not a given pupil employs efficient methods of studying a given subject. But it is often the case that the data can be obtained to better advantage with the help of other persons, as when each of the pupil's teachers is interviewed to obtain information about his methods of study. The specific uses of observation are thus determined by the need for personal contact with the source.

Regarded from this point of view, observation is useful in determining the classroom behavior of pupils

with reference to elements that have not been previously determined for the particular pupils concerned. Such elements include methods employed by the pupils in learning particular units of a course, difficulties met, degrees of skill acquired, and the like. For the same reason observation is useful in learning the social and educational status of the pupil's family, the nature of physical surroundings, and other factors of the pupil's environment that cannot be so clearly understood when reported upon by other persons.

Criteria. — The first criterion to be applied to the technique of observation is *adequacy*. To be adequate the observations should be made with such frequency or at such times as will reduce to a minimum the chance that any typical items have been missed. Adequacy also applies to the number of cases observed. When not all members of a given population can be observed, the investigator should consult the section on Sampling. The importance of adequacy in making new observations of pupils or of the school and home environment of the pupils is evident, for example, in the attempt to record the methods of study employed by a particular class. If only one observation were made, it is entirely probable that the assignment on which the pupils are working will not typify the assignments for the course as a whole. It is also likely that the stage of the unit at which the observation is made might be such as to make the pupils more energetic, more listless, more capable of self-help, more dependent

on the teacher, or more habituated in certain methods of study than would be the case if the observations were made at another stage of the unit. It is equally apparent that no safe generalizations can be drawn from observation, however continuously and systematically recorded for a particular pupil, if the problem is to define the study activities commonly practiced by all pupils of the given grade.

The second criterion is *objectivity*. Tersely stated, this criterion implies that observation should be recorded by figures rather than by adjectives. To characterize pupils' methods of study as "largely dependent upon the teacher," "largely resulting from pupils' initiative," or "resulting equally from pupil's initiative and the teacher's direction," would be far less satisfactory than to record in figures the number of minutes devoted to the teacher's direction of the group, or the number of times that individual pupils ask for help, or the per cent of the class which is working without help at each five-minute interval during the period. A still more objective method of recording observations in this case would be the type of study profile described by Morrison[1], which accounts for pupils' degree of application in intervals of ten seconds throughout the period.

The application of the two criteria mentioned may be explained more clearly in terms of a few simple rules.

[1] Morrison, H. C., *The Practice of Teaching in the Secondary School*, Chapter IX.

1. Decide what to look for. This rule requires that no observation be made at random. The more nearly the observation can be confined to a single type of behavior, attitude, or other type of specific evidence, the more adequate and objective the observation may be.

2. Systematize the observation wherever possible by the use of specially prepared forms. The observations of persons conducting surveys of various phases of school work are much more adequate, for example, when the observer has merely to determine the answers to a standardized list of questions. The Strayer-Englehart score card for use in evaluating school buildings illustrates this kind of device. It is always possible to prepare in advance of an observation a list of specific items that might not be noticed if the observer records merely the items that catch his eye.

3. While less useful in service studies than in systematic research, it is important to use mechanical devices to supplement the observer's written record. The photograph, for instance, in many cases is necessary to insure completeness of detail. Dictaphone or stenographic records are more adequate than long-hand notes.

4. Record all items relative to the purpose of the observation in as complete detail as conditions permit. This means that when the observer is in doubt whether or not to record a given item, the item should invariably be reported. It is easy to discard unnecessary

items when the report is written up in final form. It is very difficult, however, to supply any useful item which was omitted from the original record. The completeness of detail is further invited by the collection of exhibits, such as specimens of pupils' work, accurate records of the teacher's assignments, and other exhibits that may often be had for the asking.

Procedure. — 1. In planning any observation, state as explicitly as possible the particular types of data desired. For instance, in observing pupils' methods of study, one might look for pupils' methods of checking assignments to discover points not clear, pupils' methods of obtaining and arranging materials needed in preparing the assignment, pupils' methods of selecting the first thing to do in preparing the assignment, and the like.

2. Analyze the types of data desired into more specific elements by examining other studies of similar problems. It is usually possible to discover at least two or three articles in any standard bibliography which specify types of data applicable to most of the significant problems in teaching. One individual can seldom carry the analysis as far as it can be carried by two or more persons having the necessary familiarity with the data. In the case of the problem in analyzing pupils' methods of study, for example, there is an abundance of detailed analysis which it would be useless for any individual teacher to attempt to duplicate.

3. Prepare a statement of the cases to be observed

which are considered adequate with respect to the given problem. State also the number of observations and the length of time devoted to each observation which are considered appropriate. Submit this statement to others familiar with the local situation, and in case of doubt submit it by letter to persons trained in the methods of educational research.

4. Examine the list of points to be covered by the observation and select those which can be objectively described. That is to say, in observing pupils' methods of study, the list of desired items might well include points which can be covered by figures if the item is properly stated. It is useless for the observer to record his impressions of the pupils' initiative if the record of the number of pupils who ask for help will serve the same purpose.

5. Classify the items to be covered by the observation in some logical form, and prepare a blank or a check sheet to simplify the task of recording. Where several observations are to be made for later comparison, it is well to try out the check list until the most convenient form has been found. Otherwise revision of the form after the observations have begun will make comparison difficult. Needless to say, the check sheet should allow plenty of space for the addition of items that have not been anticipated.

6. Conduct the observation and record the data on the forms. Wherever a given item is not covered by a simple check, the observer should note the special

conditions that are needed to interpret the item correctly. That is to say, if, when observing pupils' methods of study, a particular pupil asks frequently for help because he lacks materials which other pupils have, notation of this fact will help to eliminate what might otherwise make for inaccuracy in the record.

7. Check the proportion of the new data obtained from each successive observation to decide when a sufficient number of observations has been made. This direction applies only to observations made for the purpose of recording *all* items of a given type, as, for example, methods used by pupils to outline selected passages of a given text. If, for instance, five methods of outlining are recorded at the first observation, these five may be checked against the methods noted in later observations. If the second observation reveals four of the five methods and two additional methods, the figure 2 indicates that not all methods have been found. If, however, no new methods are recorded at the third, fourth, and fifth observations of the given class when all pupils are engaged in making outlines, it may safely be concluded that the seven methods reported are about all that could be obtained by a much larger number of observations.

8. Write up the record of each observation at the first convenient opportunity. The form of the write-up should be as complete as possible without including details that are irrelevant to the given problem.

Whenever the given problem concerns other persons than the investigator himself, it is well to submit the write-up for criticism to the other persons interested. Such persons should be asked to criticise the write-up in respect to clearness of organization, completeness, and significance for the particular purpose in view.

References. — Examples of observation may be found in the following type studies and specimen studies.

Defining Objectives. Type Study, Step 2; Specimen Studies, No. 3, Step 2; No. 6, Step 2.

Adapting Prescribed Materials to a Given Class. Specimen Study, No. 1, Steps 1, 2, 3.

Selecting Learning Procedures. Type Study, Step 5; Specimen Studies, No. 1, Step 2; No. 2, Step 6; No. 4, Steps 1, 4; No. 5, Steps 1, 2; No. 6, Steps 1, 4; No. 8, Step 1; No. 9, Steps 1, 2, 3, 4; No. 10, Step 1.

Constructing Exercises and Direction Sheets. Type Study, Step 1; Specimen Studies, No. 3, Step 1; No. 6, Step 2; No. 7, Step 5; No. 12, Step 1.

Motivating. Specimen Studies, No. 1, Steps 1, 3; No. 6, Steps 3, 4, 5.

Testing. Specimen Studies, No. 8, Step 4; No. 9, Steps 1, 5.

Grading and Selecting Pupils. Type Study, Step 1; Specimen Studies, No. 1, Step 5; No. 5, Steps 3, 4.

Managing a Class. Type Study, Steps 2, 3; Specimen Study, No. 9, Steps 1, 2.

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4. PERSONAL INTERVIEW AND GROUP CONFERENCE

The interview is the simplest means of obtaining information possessed by other persons. Its reliability varies more widely than that of any other technique. At one extreme is the interview as conducted by the unscrupulous journalist who plies his subject with questions asked at random in the hope of drawing forth some remark on which to hang a story. At the opposite extreme is the highly reliable technique of systematic interviewing which represents an essential instrument of research. The type of interview most useful in conducting service studies approximates the standards that govern the use of interviews for research purposes and departs from these standards only when satisfactory data can be secured more simply. The group conference represents a form of interview that is highly economical of time and that is particularly convenient in obtaining data from an entire class of pupils, groups of parents, teachers, or community representatives.

General Purpose. — The purpose of interviewing is, of course, to find out what someone else knows con-

cerning the given question. More specifically the purpose of the interview as a systematic technique is to secure *all* the information possessed by a person well-informed upon a very definite question, together with such examples, illustrations, and the like as may insure correct interpretation of the replies. So described it is clear that the interview serves to supplement the other techniques of analysis, reading, observation, written statement, evaluation, and testing.

Types of Data. — Since only *persons* can be interviewed, it is evident that the types of data to be secured are the facts, opinions, judgments, and attitudes which pupils, teachers, parents, and others are capable of expressing. More specifically, the data obtainable by interviewing are subject to four important restrictions; namely, the limitations of the individuals' experience, the quality of their judgment, their accessibility and willingness to be interviewed, and their ability to convey precise meanings. These restrictions in themselves indicate the groups that are interviewed to best advantage. Hence, the interview is most useful in securing the data which these groups are best able to supply and which are not obtained so specifically by observation, reading, correspondence, or other techniques.

Pupils are experienced in such matters as their own interests, activities, and difficulties; the quality of their judgment is highly variable and is seldom reliable without careful checking. Pupils, however, are entirely accessible and willing to be interviewed, and,

in the higher grades at least, they are capable of expressing themselves with sufficient clearness. We may conclude therefore that older pupils may safely be interviewed to obtain their reactions concerning subject matter, teaching method, and school procedures in general. They may also be interviewed for facts concerning their personal behavior, home environment, and other matters that can not be determined otherwise.

Teachers, as subjects to be interviewed, have more abundant experience with respect to teaching problems and better powers of expression. Teachers, however, are usually so busy that they are not readily accessible. The quality of teachers' judgments is dependent upon the issue, upon the teachers' experience and training, and upon the completeness of the data required concerning the given issue. Yet because of the fact that information about the needs, interests and abilities of pupils enrolled in particular classes, grades, and departments can best be obtained from the various teachers of such pupils, these types of data commonly require the interview.

Other types of data contained in the master list of Chapter II and specified in the tabular analyses may be obtained by interviewing school officers, parents, community members, representatives of particular vocations, and experts in the phases of scholarship or teaching involved. In deciding what data can best be obtained by interviewing, it is necessary to take the

three steps implied in the foregoing paragraphs; namely, decide what groups possess the information desired, select the groups that are most free from the limitations mentioned, and determine the specific data that are best obtained by the selected groups.

Specific Uses. — The various uses to be made of interviewing may be most conveniently distinguished by the types of persons interviewed. In the type problems of Chapter III that concern the organization and evaluation of subject matter, the group conference type of interview is most convenient and often the most productive. That is to say, by means of carefully prepared assignments for the class as a whole, an investigator may secure a well considered report by representative pupils upon such questions as the relative importance of various course objectives, the relative attractiveness or difficulty of various text materials, the clearness of certain units, the effectiveness of particular illustrations, the relative frequency with which various learning procedures are used, the relative intensity of interest in certain motivating devices, the individual preferences for different types of test, and upon questions thus directly involved in other type problems.

This use of class assignments is extremely simple. For example, the investigator arranges with the teacher to ask each pupil to list in detail the things he does in preparing a lesson in history. At a later meeting of the class, the methods of preparing a history lesson

may be discussed — one pupil reading his list and the others contributing variations of each step in the procedure. If a stenographer is present to record what is said, the result is often a more useful collection of data than could be obtained by interviewing each pupil individually. Individual pupils are often less fluent than the group. Representative pupils should usually be interviewed privately, however, to check the reliability of data obtained by group conference.

A specific use of the individual interview is to study the learning processes of individual pupils. If, for example, a certain pupil or group of pupils has particular difficulty in relating the facts of history to the political problems of the present day, the interviewer may prepare a list of significant facts and a list of related problems which the pupil is asked to match, giving reasons to explain the relationships he mentions. By questioning such reasons as are not valid and noting the pupils' reactions, the interviewer may obtain an intimate knowledge of the methods whereby the pupil arrives at historical concepts. Much the same procedure may be followed to collect data bearing upon the diagnosis of pupils' interests, difficulties, and other reactions to classwork. The interview is usually essential in diagnosing pupils' interests.

A third specific use of the interview is to obtain evaluations or judgments from teachers and other persons whose opinions are important and whose judgments are trustworthy. Having determined, for ex-

ample, the causes for pupils' failure to interpret historical readings accurately, the interviewer may collect from other teachers the methods used to teach accurate interpretations. Since the purpose here is to discover *what* the teachers think rather than how they think and feel, the procedure differs somewhat from the procedure used with pupils. It is necessary to supply the teachers with sufficient information to prevent them from missing the point. Samples of pupils' work showing both accurate and inaccurate interpretations would probably help to direct the discussion. The teacher might be shown the inaccurate interpretation and be asked to describe the methods by which the pupil might have been taught to avoid it.

Criteria. — The first criterion for the success of an interview is the *validity* of the data obtained. Validity, in turn, depends upon the qualifications of the person interviewed to discuss the question proposed. Validity is also dependent upon the degree to which the persons interviewed represent the total number of qualified persons. For example, if the problem is to determine difficulties met by pupils in learning history, the investigator would doubtless need to interview representative pupils, teachers of history who are particularly well qualified to diagnose pupils' difficulties in learning, and such other students of educational psychology as are best qualified to describe efficient methods of learning the subject of history.

It would clearly be impossible to arrange personal

interviews with all persons of the three types mentioned. Sampling is, therefore, necessary. In selecting the subjects to be interviewed, one should bear in mind the fact that an interview may require as much time as one-half hour for each pupil and one hour for each adult. Hence, it is seldom practicable to interview more than 25 or 30 persons in the course of a service study. The sampling must, therefore, be made with great care to include those persons who will produce the most useful material. This consideration justifies considerable effort in arranging interviews with the few persons who have most to give on the particular question, even though they be persons of national reputation and hence hard to reach.

A second criterion for the successful interview is *motivation*. The interview is more productive than any form of questionnaire for the reason that it is easier for most people to talk than to write. Yet particularly in the case of pupils and persons of somewhat reticent disposition, it is sometimes a problem to start the subject talking. It is, therefore, important to arouse the subject's interest in the question discussed, and various methods of securing this interest must sometimes be applied before an effective method is found.

Among the important methods of arousing interest are the following:

a. In case the person to be interviewed is a stranger, it is important to secure somewhat impressive introductions. If a teacher wishes to interview a specialist

with whom he is not already acquainted, it is usually wise to mail a letter of introduction from the superintendent which will explain the purpose of the interview and request cooperation. When the person to be interviewed is a community representative or a teacher of another school, the introduction is no less important. If the introduction can make clear that the person's time and ideas are regarded as highly valuable, the subject often takes the interview more seriously than he otherwise would.

b. The interviewer should make an appointment with the subject and conduct the interview in an entirely businesslike manner. While the discussion of each question should be deliberate, it is important that the interview should not degenerate into a casual conversation. Frequent reminders by the interviewer to the effect that he wishes *all* that the subject has to contribute will usually serve to maintain the desired degree of formality.

c. It is particularly important that the direction of the interview and its probable length be determined in advance by carefully prepared questions. In the case of an interview to determine pupils' difficulties in learning history, the number of questions should probably not exceed five, asked either of pupils or teachers. Since the value of the interview consists in the opportunity to follow up the subject's replies, it is important to allow plenty of time for intensive discussion of each question. Hence, the questions should

be formulated in advance and tried out on typical subjects. By this means any ambiguity in the questions may be removed and the questions may be phrased in such a way as to increase the likelihood of obtaining the particular information desired.

A third criterion for the success of the interview is the *completeness* of the data obtained. The foregoing suggestions with regard to the preparation of specific questions and the intensive discussion of each question serve both to increase the completeness of the data and to retain the subject's interest. Supplementary questions are usually needed to secure concrete examples that make the meaning clear. It is also desirable to experiment with different wordings of the same question in case the question as planned in advance does not cover the points involved.

Procedure. — 1. Select persons to be interviewed who possess the data desired. This step has been already commented upon and needs no further illustration.

2. Select from the appropriate groups the individuals most conveniently interviewed. In the case of the example used throughout, one would naturally interview the pupils in a given school and grade to discover their difficulties in learning history. One would also interview other teachers of the history department and history teachers in neighboring schools. If there are specialists in the locality, these would be interviewed in preference to others at a greater dis-

tance. However in case it is necessary to reach some authority of outstanding importance, convenience might be sacrificed to the extent of making a long trip to obtain the interview, if permission is secured.

3. Specify the data best obtained from each type of person to be interviewed. In the case of difficulties in learning history one would expect to obtain from pupils only difficulties of a superficial character such as difficulties in obtaining the desired materials, difficulties in avoiding distractions, difficulties in interpreting the text, and the like.

4. Prepare such materials as may be needed to make clear the type of data desired. It might be necessary, for example, in interviewing teachers, to mention certain difficulties in learning history that have proved troublesome to the interviewer. Care must naturally be taken in supplying such illustrations not to supply so many as to restrict the subject's thinking.

5. Make an appointment in advance with the aid of introductions. Take the necessary pains to secure the subject's cheerful consent to the interview.

6. Prepare and try out the questions which will serve as the basis for the interview. For example, the following questions might be used in interviewing teachers and pupils to collect difficulties in learning history.

For Teachers:

1. Name as many as you can of the difficulties which pupils in general encounter in learning ninth grade history.

2. What are the most frequent reasons for failure in the subject?
3. Think of one pupil who failed the subject last semester. What were his or her greatest difficulties?
4. What personal traits or qualities are conspicuous in those pupils who do the best work in the subject? Think of some one superior pupil. Which of these traits are evident?
5. What traits or qualities are evident in those pupils who do the poorest work in the subject?
6. Think of some one pupil who has shown most improvement during the term. What difficulties did he or she overcome? What traits were most evident in this pupil?

For Pupils:

1. What requirements in ninth-grade history cause you the most trouble?
2. What are the things which a pupil must do to get a good mark?
3. In what ways do you think you have improved most during the course so far?
4. Think of the best pupils in your class. What is there about him or her that explains why he or she gets such good marks?
5. Think of the poorest pupil in the class. Why do you think he or she does so poorly? What do you think, are his or her greatest difficulties?

7. Ask the first question. Record the subject's replies in detail and follow up with other questions needed to secure specific examples and illustrations. For instance, after having asked the first question of the foregoing list, the interviewer might properly ask

for a description of each difficulty mentioned in terms of particular pupils who have met it.

8. Write up the notes taken during each interview at the earliest opportunity and while the details are fresh in mind. It is best to organize the report according to questions asked. When all the interviews have been completed the organization may then be revised in a form most readily applied to the given problem. For example, in organizing the replies to the foregoing questions one would naturally group together the difficulties of the same type regardless of the questions used to secure the various difficulties.

9. Reorganize the reports of individual interviews in summary form and apply to the given problem. In the case of the difficulties in learning history the problem is clearly how best to help pupils to overcome the difficulties that are most frequent and serious. The summary organization of the difficulties would thus probably consist in a logical classification which could be used to obtain judgments regarding the relative importance of the difficulties and regarding the best methods of overcoming those of each type.

10. Check the adequacy and reliability of the data obtained from the interviews by submitting them to experts in the particular field who are not accessible for interviewing. The importance of this step naturally depends upon the precautions taken to plan the interviews so that the returns may be assumed to be sufficiently valid and complete.

References. — Examples of personal interview and group conference may be found in the following type studies and specimen studies:

Defining Objectives. Specimen Studies, No. 6, Step 3; No. 7, Step 3; No. 8, Step 2; No. 9, Steps 1, 2, 3, 5, 6.

Constructing or Reorganizing the Course. Specimen Studies, No. 1, Step 1; No. 2, Step 1; No. 9, Steps 1, 2.

Selecting Text Materials. Specimen Studies, No. 3, Step 3; No. 6, Step 3; No. 7, Step 4.

Adapting Prescribed Materials to a Given Course. Type Study, Steps 2, 3; Specimen Studies, No. 2, Steps 2, 4; No. 5, Steps 2, 3, 4, 5; No. 6, Steps 1, 2; No. 7, Steps 1, 2, 3; No. 8, Step 3; No. 10, Step 1.

Selecting Learning Procedures. Type Study, Step 3; Specimen Studies, No. 1, Steps 2, 4; No. 3, Step 2; No. 5, Steps 1, 2, 5; No. 6, Steps 1, 3; No. 7, Step 3; No. 8, Steps 1, 3; No. 9, Steps 1, 4; No. 10, Steps 2, 3.

Constructing Exercises and Direction Sheets. Type Study, Step 1; Specimen Studies, No. 1, Step 3; No. 3, Step 2; No. 5, Steps 4, 5; No. 6, Steps 2, 5; No. 7, Steps 5, 6; No. 9, Step 4; No. 10, Step 2; No. 11, Step 4.

Motivating. Type Study, Step 2; Specimen Studies, No. 1, Step 3; No. 2, Steps 1, 2, 3; No. 3, Steps 1, 2, 3; No. 4, Step 1; No. 5, Steps 1, 2, 3; No. 6, Steps 2, 3, 4, 5; No. 7, Steps 1, 3, 4; No. 8, Steps 2, 4.

Testing. Specimen Studies, No. 1, Step 3; No. 3, Steps 2, 3; No. 9, Steps 1, 5.

Grading and Sectioning Pupils. Type Study, Step 1;

Specimen Studies, No. 1, Steps 1, 2, 4, 5; No. 2, Steps 1, 3; No. 3, Steps 2, 3, 4; No. 4, Steps 2, 3, 4, 5.

Managing a Class. Type Study, Steps 2, 3; Specimen Studies, No. 1, Step 2; No. 2, Steps 1, 3, 4, 6; No. 3, Step 1; No. 4, Step 3; No. 5, Steps 4, 5; No. 6, Steps 1, 2, 3, 4; No. 7, Steps 2, 3; No. 8, Steps 2, 5, 6, 7; No. 9, Steps 5, 6; No. 11, Steps 3, 4, 5.

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5. Obtaining Written Statements by Question Blanks

The written statement comes between the personal interview and the check-list with respect to the definiteness of the data obtained. The interview makes for greater variety and abundance of data: the check-list confines the responses to a prepared list of items and hence has the great advantage of omitting all data that are irrelevant. The written statement, submitted in reply to one or more specific questions, may have the advantages or the disadvantages of both, depending upon how it is used. That is to say, the written statement may be obtained from a larger number of persons than are accessible for personal interview and more abundant data may be obtained than the check-list provides. However, the request for a written statement is more easily ignored than the request for an interview, and the respondent may supply irrelevant data that the check-list would exclude. This relationship among the three techniques is important in deciding which to use, since all three may under appropriate conditions be used to obtain the same or similar types of data.

The tabular analyses, taken as a whole, make more frequent *mention* of the question-blank than of any other single technique; yet the purposes for which written statements are *essential* are less numerous than those demanding other techniques applicable to personal sources. This fact simplifies the present descrip-

tion of the technique by making it unnecessary to discuss the types of data that may be obtained by written statements. For these the reader is referred to sections 4 and 6 of the present chapter.

General Purpose. — The primary purpose in securing written statements of fact or opinion from persons qualified to make such statements is to encourage the respondent to prepare his statement deliberately. Deliberation and accuracy are essential when the data need to be recorded by a number of individuals over a considerable period of time — as in collecting pupil misdemeanors, or evidences of a particular ability in certain pupils, or occasions on which a particular teaching device is used to good effect. Such data are best collected by inducing the teacher or other observer to keep a daily record or diary.

A secondary purpose of the written statement is to secure facts and opinions from a large number of persons when the facts and opinions desired cannot be predicated in advance. To determine, for example, the methods commonly used to motivate practice exercises in foreign language classes would probably involve a request for written statements by teachers, unless it is assumed that such methods are all contained in the literature or that they are all known to a few specialists in the teaching of the given subject. If the methods are all contained in the literature, the procedure would be to prepare a check-list on which a representative group of teachers might indicate the

methods used and the methods preferred. If the methods are all known to a few specialists, the specialists would be interviewed or would be asked by a personal letter to submit a complete list of the methods. However, when the data are not contained in the literature and are not known to a few specialists, it is usually necessary to collect written statements from a representative number of persons.

Types of Data. — There are, accordingly, certain important considerations regarding the types of data that may safely be obtained in the form of written statements. The first of these is that the data desired are not already obtainable in published form or in other writings not published, as already suggested. Before undertaking to request written statements, it is, therefore, obviously necessary to investigate the literature.

A second consideration in selecting the types of data to be obtained by written statements is the extent to which the data are capable of brief statement in definite terms. In collecting uses for pupils' notebooks in general science courses we have a type of data that are capable of brief statement — such as, to record results of experiment, to record questions of interest to the individual pupil, and the like. On the other hand, it would be difficult to obtain satisfactory statements in brief form of teachers' opinions concerning the value of the notebook. Such statements had better be obtained by interview.

Specific Uses. — There are four different varieties of written statement, and each variety has certain advantages for particular purposes. The first of these is the diary. The diary is obviously useful in securing data that need to be recorded over a considerable period of time. In attempting to collect specific uses for pupils' notebooks, it is likely that diaries kept by a selected group of teachers would prove more helpful than lists of uses which a large number of teachers might prepare offhand. In collecting data that vary from time to time for the same group of pupils or teachers or community members, the diary is highly valuable. Its disadvantage consists in the labor of making it and in the difficulty of persuading persons not interested in the subject to record the desired amount of detail.

A second variety of written statement is the personal letter in reply to one or two simple questions which the respondent is asked to discuss at some length. The personal letter avoids the wholesale effect of questionnaires and is usually the most effective means of obtaining help from specialists at a distance. A carefully worded letter addressed to a recognized authority will often clear up many problems that might not otherwise be solved by many weeks of labor. Whether or not the letter draws the desired information depends very largely upon the convincingness with which the problem is presented. Most authorities will be found willing to reply to personal letters in

which it is clear that the writer is in need of important information which the author can readily supply.

A third form of written statement is the question-blank which requests opinions. Generally speaking, this type of question-blank is justified only when the questions are extremely few and when the respondent's opnions can be expressed by checking or by very brief statements. The particular uses of this device are discussed in the section devoted to the check-list which it very closely resembles.

A fourth type of written statements is the question blank which seeks to obtain certain facts. In form, this blank resembles the check sheet described as a means of recording the results of observation. At its best, it presents a few carefully prepared questions to those persons only who have the facts at hand. The form should also supply whatever materials will reduce the amount of writing to a minimum, as when requesting a number of facts concerning the correction of pupils' notebooks in general science, various facts are listed for the respondent to check.

Criteria. — As a technique for collecting and interpreting data, the success of the written statement may be judged first for its *motivation* or drawing power. That is to say, the request for the written statement must be so worded as to secure satisfactory replies from a large proportion of those to whom it is addressed.

There are various devices that serve to increase the number and the completeness of the returns. (1) In

practice the most efficient device has proved to be to pay cash for the service rendered. While teachers who conduct service studies can seldom afford this outlay, the fact should be recognized that persons who have valuable ideas usually set a money value on their time, and the labor of filling out a questionnaire deserves to be paid for. (2) Next in order of importance is the device of persuading the respondent that the inquiry is important, thereby enlisting his interest as a collaborator in the project. Such interest may be developed by personally interviewing the respondent, by writing first to explain the study and to request his help before the question blank is sent, etc. (3) Another device is that of appealing to authorities in various school systems and educational organizations who are in a position to have the written statements prepared by official order.

A second criterion for the success of the written statement is the *validity* of the information obtained. This means that the statements themselves should bear directly upon the real point in the inquiry, should represent the best judgment of the best qualified persons, and should be clearly interpreted. If the replies are to bear upon the point, it is necessary for the questions to be prepared with extreme care, as in the interview. They should be submitted in advance to persons below the mental level of the group to whom the revised questions will be sent. The questions then should be rephrased until they are entirely clear.

For the replies to represent the best judgment of the best qualified persons, the mailing list should contain only the persons who have the desired information in mind. The questions should apply only to the matters in which those addressed have had experience. The replies should be capable of brief statement. The clearness with which the replies are interpreted depends almost entirely upon the concreteness and simplicity of the question. This means that the questions should be answered by figures in the ideal questionnaire.

The foregoing remarks on the criteria that apply to written statements have been directed chiefly at the questionnaire or question-blank, since written statements are most commonly obtained by these forms. The same criteria apply, however, to the diary and to the personal letter. In connection with the whole matter of obtaining information in writing, the fact should be emphasized that the interview should usually precede the request for written statements and that a check-list should follow it. That is to say, it is difficult to know specifically what questions can be effectively answered in writing until some data have been obtained by interview. Hence some interviews should normally precede the use of a question-blank. Also it is seldom possible to determine all the items to appear in a check-list without using some form of question-blank. Hence the returns to the question-blank should be prepared in the form of a check-list and re-submitted to the persons replying to the ques-

tion-blank, in order that each respondent may indicate the relative value of the items for the given purpose.

Stated more concretely by example, this means that to obtain a list of uses for pupils' notebooks in general science, one would first interview a few expert teachers to discover the more obvious uses. One would then prepare a question-blank (or request teachers to keep diaries or write personal letters) to secure additional uses of notebooks. One would then throw all the uses discovered into one check-list, properly classified, and submit this list to a representative group of competent judges so that each judge may indicate the more important uses of pupils' notebooks as applied to each of the typical objectives of the course in general science.

Procedure. — 1. Experiment first with other techniques — such as reading, observation, interview, check-list, and experiment — before deciding to use the question-blank. In general it is best to use the question-blank only to secure specific facts from a larger number of persons than can be reached by other means.

2. Select respondents for the mailing list who occupy positions that guarantee their possession of the desired information.

3. Arouse the interest of the respondent by applying as many as possible of the motivating devices mentioned.

4. Prepare the question blank with direct reference to the group of respondents selected. Each question

should call for replies in as objective terms as possible — i.e., figures, checks, or brief comments underscored.

5. Try out the tentative form and revise all points that the returns show to be at all ambiguous.

6. Circulate the blank to the respondents and follow up all persons who fail to reply by the date mentioned.

7. Tabulate the returns or organize the findings in a clear summary that bears directly upon the given problem. Re-submit the summary to the respondents both as a means of thanking them for their help and in order to check or supplement the findings. That is, when two copies of the summary of the replies are sent to each respondent, he may be permitted to keep one copy. He should be asked to indicate on the other copy the points he finds inaccurate and to supply any additional items which the summary suggests.

8. The items reported by the question-blank frequently need to be evaluated before they are used. In this case the returns should be organized in the form of a check-list which is sent to each of the respondents to the question-blank and to such other qualified persons as are necessary.

References. — Examples of written statement may be found in the following type studies and specimen studies:

Defining Objectives. Specimen Studies, No. 1, Step 1; No. 5, Step 4; No. 6, Step 1; No. 8, Steps 2, 3.

Constructing or Reorganizing the Course. Specimen

Studies, No. 1, Step 2; No. 2, Step 1; No. 5, Step 6; No. 7, Step 3; No. 8, Step 1.

Selecting Text Materials. Specimen Studies, No. 1, Step 1; No. 4, Step 1; No. 5, Step 4.

Adapting Prescribed Materials to a Given Class. Specimen Studies, No. 7, Step 3; No. 8, Step 3.

Selecting Learning Procedures. Type Study, Step 3; Specimen Studies, No. 4, Steps 1, 3; No. 5, Step 5; No. 6, Step 3; No. 9, Step 1.

Constructing Exercises and Direction Sheets. Specimen Studies, No. 1, Step 3; No. 3, Step 2; No. 6, Steps 2, 5.

Motivating. Specimen Studies, No. 2, Step 6; No. 3, Step 1; No. 6, Step 1; No. 8, Step 5.

Testing. Specimen Study, No. 4, Step 1.

Grading and Sectioning Pupils. Specimen Studies, No. 1, Step 4; No. 2, Step 3; No. 4, Steps 2, 3; No. 5, Steps 1, 2.

Managing a Class. Type Study, Steps 1, 2, 3; Specimen Studies, No. 2, Steps 3, 4, 5; No. 4, Steps 1, 2, 4; No. 7, Steps 2, 4; No. 8, Steps 1, 2, 6, 8; No. 9, Step 1; No. 10, Step 1; No. 11, Steps 1, 4.

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6. Check-List

The check-list is commonly used in connection with other techniques. Thus, group rating, testing, observation, and even reading and recording may involve the check-list. For this reason the following discussion of the method will not include specific descriptions of uses which are described more fully in other sections.

General Purpose. — The purpose of the check-list is to present items of data in such form that persons may react to them readily. The list simplifies reactions. For example, a teacher, through observation and interview may have collected the various pupil activities performed by members of his class in preparing a history lesson. These activities may then be assembled into a check-list and presented to several experienced history teachers, the teachers being asked to indicate the learning procedures which they consider

useless. Or, again, in diagnosing a pupil's difficulties in arithmetic, Buswell and John prepared a check-list of the significant operations involved in solving certain typical problems. They used this check list when observing individual pupils at work, asking the pupil to do his work aloud, and checking each error on the check list.

From these illustrations it is apparent that the check-list serves to assemble data for evaluation, to direct attention toward certain significant elements while observing, or while reading and recording, and to simplify the recording of the evaluation or the observation or the reading.

Types of Data. — Whenever several items of data are collected, a check-list may be used to assemble them. Hence, any type of data may be assembled by a check-list. An examination of the tabular analyses, however, shows that the major types of data collected by means of check-lists include the following:

1. Objectives.
2. Community activities, traits and problems.
3. Pupil activities, traits and difficulties.
4. Pupil interests and ambitions.
5. Materials.
6. Topics for the course.
7. Applications of course material.
8. Causes of pupil difficulties.
9. Methods for overcoming pupil difficulties.

Specific Uses. — As may be inferred from the pre-

ceding paragraphs, the check-list serves at least four distinct purposes. The most common use is to assemble data for evaluation, that is, for rating purposes. For example, having collected a bibliography of references for geography, one may wish to select the most helpful references to use as supplementary material for the class. The bibliography might be assembled into a check-list and sent to experienced geography teachers with the request that they check the references which they consider most helpful for such a class. Or, lists of objectives might be assembled into a check-list and rated with reference to a given class. In fact, any of the data listed in the preceding paragraph might be assembled into a check-list for evaluation in terms of specified criteria.

The second use of the check-list is to guide or direct classroom observation. In observing instruction, a check-list of teaching procedures, or of type difficulties, or of other elements is helpful in making the record complete. In observing pupils at work, a check-list of common difficulties is helpful in identifying the difficulties actually present.

The third use of the check list is in connection with reading and recording where it serves as a guide in directing attention toward certain elements which are sought in the literature. Thus, a check-list of pupil difficulties in arithmetic might be used in collecting teaching devices from books on methods of teaching arithmetic. A check-list of course topics might be

helpful in obtaining appropriate illustrations from books and magazines.

The fourth use of the check-list is to simplify the recording of data. The fact that reactions to check-lists may be recorded by simple checks, marks, or letters, explains its popularity as compared with the questionnaire. For example, the relative importance of the objectives in a given list was recorded merely by marking each one, "1," if very important, "2," if important, "3," if unimportant. The most helpful geography references in a given list were indicated by the simple device of placing a check mark in front of each such reference. The study habits followed by an unsuccessful pupil were noted simply by underlining each habit observed by the teacher.

Criteria. — The most important criterion for a check-list is *completeness*. Since the check-list presents a list of items for evaluation or for directing attention toward significant elements, it is essential that every significant item appear. The items in a check-list must be *specific* enough to indicate significant differences. Thus a check-list for diagnosing pupils' difficulties in arithmetic is not helpful if it contains general items like "addition," and "multiplication." Specific items such as "combination of 8 and 7," "carrying 1," "combination 19 and 3" are needed to identify the difficulties.

The items in a check list and the criteria to be applied to them should be *clearly defined* so that others may use the list without being perplexed by vagueness and

ambiguity. Sufficient explanation should be provided to stimulate frank and honest reactions. Furthermore, the directions for use should be so *explicit* that they may be followed without difficulty. Finally, the check-list should be so constructed as to make the checking *simple*. This is particularly necessary when check-lists are long and time is short.

Procedure. — Before preparing a check-list one must, of course, collect the items to be included. The items may be obtained by interview, written statement, analysis, reading and recording, or by a combination of these. The following steps are necessary in preparing the check-list.

1. Make certain that the list of data is complete. This may be done by consulting additional sources until no new items appear. Thus, a list of pupils' study habits obtained from pupils by interview and observation might be checked for completeness by reading professional literature on study. If continued reading fails to discover new habits, the list is assumed to be complete. If new habits are discovered then the list is not complete. Instead of consulting the literature or as a means of checking the adequacy of the literature, the tentative list of habits might be sent to other teachers with a request for additional items. When still other groups of teachers fail to discover any omissions, the list is sufficiently complete for practical purposes.

2. Make certain that the items in the check-list are

sufficiently specific or defined with sufficient clearness for the purpose of the study. This may be done by actually testing a sample of the complete list or by personal judgment.

3. If the check-list is to be used for rating purposes, criteria need to be chosen and clearly defined. For example, an English teacher wishes to obtain pupils' judgment regarding the selections provided for supplementary reading. The criteria to be used must depend upon the purpose in view. If the teacher wishes to know how well the selections are enjoyed by the class he will choose the criterion "enjoyment." In this case "enjoyment" might be defined as "how well do you like the selection? If you like the selection, mark it 1, if you dislike it, mark it 3, and if you are indifferent towards it, neither liking nor disliking it, mark it 2." On the other hand, if he wishes to determine whether the selections are adapted to the pupils' reading abilities the teacher might have chosen the criterion "difficulty." This criterion would also require clear definition so that it might be consistently applied by each member of the class.

4. Determine a method of checking which will be as simple as possible. Avoid elaborate codes, and, in general, allow no more than five points on the checking scale. In most cases three points are sufficient. Thus, in rating difficulty, the three points might be "very difficult," "average difficulty," "easy." The marking should be simple; a check mark, or underlining, or marking "1," "2" or "3" are easy to apply. A good

illustration of a check-list appears in the accompanying exhibit. Note the method of checking, the introduction, explanation, and the explicit directions.

STUDENT OPINION ON WAR[1]

You will find in this pamphlet statements of different kinds on the subject of war. They have been gathered from many places so that you can mark your agreement or disagreement with them. You will surely find some with which you disagree, perhaps some of which you strongly disapprove. This pamphlet is not intended, however, to convert people to any ideas about war, for or against it, but simply to find what American students think about it.

On nearly all the questions raised here there is much difference of opinion among people, young or old. So there cannot be any list of "correct answers" to compare with yours. Your set of answers will be one of the best if it gives in each case your own honest opinion.

No opinion you express will be divulged to any person or organization by the author or the few persons who will assist him, no one of whom is connected with any organization concerned with war, for or against it. The only results made public in any way will be mass results, which will not distinguish individual students or schools.

INSTRUCTIONS

How To Vote on the Statements Which You Will Find in the Pages Following This One

☐ ☐ ☐ ☐ ☐ You will find that each statement has five small squares opposite it, in the left margin. As an illustration, there are five squares in the margin opposite this sentence.

[1] Courtesy of Eliot Porter, University of Chicago, 1926.

☒ ☐ ☐ ☐ ☐ After you have read the first statement on page 3, if you are sure that you agree with it, mark a cross (x) in the first square at the left (as you see one printed opposite this sentence);

☐ ☒ ☐ ☐ ☐ if you are inclined to agree, but are not sure, put the cross in the second square from the left (as you see one printed opposite this sentence);

☐ ☐ ☒ ☐ ☐ if you are undecided either way, or do not understand the question, put the cross in the third square from the left (as you see one printed opposite this sentence);

☐ ☐ ☐ ☒ ☐ if you are inclined to disagree, but are not sure, put the cross in the fourth square from the left (as you see one printed opposite this sentence);

☐ ☐ ☐ ☐ ☒ if you are sure you disagree, put the cross in the fifth square from the left (as you see one printed opposite this sentence).

Do not study too long over a single statement. If you feel no preference after thinking about the statement for a few moments, mark it "Doubtful" and go on.

Be sure to put a cross opposite EACH statement, but in ONE square only.

Below are the five ways in which you can mark a statement, and what each marking means.

☒ ☐ ☐ ☐ ☐ Certainly right.
☐ ☒ ☐ ☐ ☐ Probably right.
☐ ☐ ☒ ☐ ☐ Doubtful.
☐ ☐ ☐ ☒ ☐ Probably wrong.
☐ ☐ ☐ ☐ ☒ Certainly wrong.

Begin to vote here:

(A) Alleged Causes of War

☐ ☐ ☐ ☐ ☐ 1. "Human pugnacity, rivalry and self-interest make the abolition of war impossible."

☐ ☐ ☐ ☐ ☐ 2. "Pugnacity, rivalry, and self-interest are natural, but need not result in war any more than human desire for dominance need result in slavery."

☐ ☐ ☐ ☐ ☐ 3. "We cannot hope to do away with war, because it is part of the unending struggle for survival in a crowded world."

☐ ☐ ☐ ☐ ☐ 4. "The prevention of war calls for a change in the conditions under which men live, so that the best tendencies are encouraged, and the dangerous ones discouraged or employed in ways which are not destructive."

☐ ☐ ☐ ☐ ☐ 5. "Experience has shown that persons of different races can get along without fighting, if they are not spurred on by unnecessary hatreds."

☐ ☐ ☐ ☐ ☐ 6. "Whatever the diplomatic excuse, every great conflict in modern times has had its real cause in some question of trade or property rights."

☐ ☐ ☐ ☐ ☐ 7. "Modern wars have been caused more by moral principles than by commercial questions."

☐ ☐ ☐ ☐ ☐ 8. "Peace is endangered by the fact that in many parts of the world governments are supporting oil and other interests with threats of armed force."

☐ ☐ ☐ ☐ ☐ 9. "American intervention in Mexico has been made necessary largely to protect oil, railway, and mining interests of Americans."

☐ ☐ ☐ ☐ ☐ 10. "Modern wars have been caused largely by diplomats who have played with human lives as pawns in a game of chess."

5. In case of rating lists, prepare an introductory explanation which will serve to obtain frank and honest reactions. It is often difficult to get frank reactions from pupils. They are likely to give responses which they think the teacher wants or expects instead of expressing their own attitudes. For example, in an English class, several pupils marked certain classics as "liked very much," then afterwards admitted that they considered these classics painful and much preferred selections in "True Story Magazine." Various methods have been used to stimulate frank and honest reactions, usually involving attempts to eliminate the motive for concealing honest opinions. One of the most effective devices is to explain the importance of frank responses in the study; then specify that the pupils are not to place their names on the blanks, so that they may feel free to express their real opinions.

6. Write out explicit directions for checking the list. Test the clearness of the definition of the items and criteria, the effectiveness of the introductory explanation, and the clarity of the directions by trial with

several persons similar to those who are to check the list. Make such modifications as are indicated by the trial. The check-list is now ready for use.

References. — Examples of the use of the check-list may be found in the following type studies and specimen studies:

Defining Objectives. Type Study, Step 3 b; Specimen Studies, No. 1, Steps 1, 2, 3, 4, 7; No. 4, Step 2; No. 6, Step 4; No. 8, Step 1, No. 9, Steps 1, 3.

Constructing or Reorganizing the Course. Type Study, Steps 3, 3 a; Specimen Studies, No. 1, Step 3; No. 2, Steps 2, 3, 6; No. 4, Steps 2, 3; No. 5, Steps 3, 4, 5, 6; No. 7, Step 4; No. 8, Steps 2, 3.

Selecting Text Materials. Type Study, Steps 1, 2; Specimen Studies, No. 1, Step 3; No. 2, Step 2; No. 3, Step 2; No. 4, Steps 2, 4; No. 5, Steps 8, 9; No. 6, Step 3.

Adapting Prescribed Materials to a Given Class. Type Study, Step 2; Specimen Studies, No. 7, Steps 2, 4; No. 8, Steps 1, 2, 3; No. 9, Steps 2, 3; No. 10, Steps 1, 2, 3, 4.

Selecting Learning Procedures. Type Study, Step 3; Specimen Studies, No. 1, Step 4; No. 2, Steps 1, 2, 4; No. 6, Step 2; No. 7, Step 4; No. 10, Steps 1, 2, 3.

Constructing Exercises or Direction Sheets. Specimen Studies, No. 3, Step 2; No. 6, Steps 3, 5; No. 10, Step 2.

Motivating. Specimen Studies, No. 2, Step 2; No. 5, Step 4; No. 6, Step 1; No. 7, Step 1; No. 8, Step 3.

Testing. Type Study, Steps 1, 2, 3, 4, 5; Specimen Studies, No. 1, Step 6; No. 2, Steps 1, 3; No. 4, Steps 2, 3; No. 6, Step 1; No. 8, Steps 1, 2, 3, 4.

Grading and Sectioning Pupils. Specimen Studies, No. 1, Steps 2, 3; No. 3, Steps 1, 2, 3.

Managing a Class. Type Study, Step 1; Specimen Studies, No. 1, Step 5; No. 5, Step 1; No. 6, Step 3; No. 8, Steps 3, 4, 5; No. 10, Step 4, No. 11, Step 4.

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7. SAMPLING

General Purpose. — Very often one needs to know certain things about a large group when it is impracticable to examine every case in the group. In such situations it is common to select a portion, or sample, of the large group for examination. When properly chosen the sample may be assumed to represent the large group. The selection of the portion or sample to be examined is the process called sampling. An illustration of the need for this technique is seen when a teacher wishes to collect the words commonly misspelled by members of his class. Obviously, he has not time to examine every word each pupil has written. It is necessary to take a sample of the work of each pupil, examine the samples and then assume that the words most frequently misspelled in the samples are the words most frequently misspelled in all the writing these pupils do. Hence sampling selects a portion of the entire group under consideration so that the data obtained from the sample will adequately represent the entire group for the purposes of the study.

Types of Data. — Since the purpose of sampling is to choose a portion of the group which is too large for study, it follows that this selection may be applied both to sources and data. Thus, a source is sampled

when thirty members from a community are selected for interview to obtain a list of community civic problems. In the same way, data are sampled when twenty difficulties encountered by pupils in arithmetic are selected from a list of ninety-two difficulties collected from the class.

Sampling should be used with any source or any type of data whenever it is necessary to select a portion of a large group to represent it. It is, therefore, unnecessary to list all the sources and data to which sampling may be applied.

Specific Uses. — There are two points in a service study at which sampling is likely to be required. The first is in planning the study, when specific sources must be selected from which to collect data, if the available sources are too numerous to examine. Thus, in determining community uses of English, the sources might be members of "occupational groups," and "community members at large." In determining the causes of failure in reading, pupils and teachers might be interviewed and school records consulted. In such cases, when it is impossible to collect data from all of the community members, pupils, teachers, or school records, sampling may be used in selecting the specific persons or records to represent each group. Data will then be collected from these samples.

Sampling is also used in selecting the data to be organized for interpretation, in case more data have been collected than can be treated adequately. Thus,

one may have pupils collect the arithmetic problems encountered in the home and bring them in each week. So many problems may be collected that they cannot all be analyzed and classified for comparison with the items in the present course of study in arithmetic. In this case sampling can be used to select the specific problems to be analyzed and classified.

Criteria. — Four criteria may be distinguished as of primary importance to the technique of sampling. Since the technique itself arises from the impracticability of examining large masses of data, *practicability* is important. As applied to service studies, practicability means the selection of small samples and the use of simple devices in selecting the samples.

On the other hand, if the data obtained from the samples are to be used to represent the whole or universe from which the samples were obtained, *validity*, *adequacy*, and *reliability* are essential. Validity as applied to a sample demands that the sample include the characteristics which are the significant features of the group from which the sample is taken. The significant features of the whole group should be present in the sample. Adequacy, moreover, implies that the sample contains enough data to represent the large group and that the data are distributed in the sample in the same manner that they are distributed in the group under consideration. The sample is a complete and a properly proportioned picture of the large group.

Reliability when applied to sampling does not refer

to the correspondence between the sample and the whole but to the correspondence between one sample and another chosen more or less at random. Will other samples chosen from this whole or large group according to the plan by which this sample was chosen have similar characteristics?

Validity, adequacy, and reliability are thus criteria often demanding larger samples and more care, whereas practicability demands small samples and ease of selection. How to balance these conflicting criteria is the major technical problem involved in sampling.

Problems Involved in Applying the Technique. — The collection of words commonly misspelled by a given class from samples of their written work may be used to illustrate the two problems involved in sampling. If the teacher were to select the samples from the geography papers alone, he must assume that these samples represent all the writing done by the pupils. But it is quite probable that geography has a rather specialized vocabulary and that many words which the pupils would write in personal letters or in English themes, for example, might not appear in the geography papers. Similarly, in determining the community uses of English it would be unwise to interview business men only, since it is probable that the housewife, the farmer, or the professional man might have other uses for English, not revealed by interviewing business men. The first danger in sampling is the neglect of factors known to influence the characteristics

under examination, as in the neglect of papers from other school subjects, or the neglect of persons from other occupations, as in the illustrations above.

The other danger involved in sampling is illustrated by a spelling investigation in which the teacher selects for examination only one paper from each pupil. There are so many chance factors influencing the pupil's use of words and a single paper contains so few words, such a small percentage of his vocabulary, that a single paper is not likely to represent all of the pupil's written work. Similarly, in determining community uses for English, a sampling of persons to be interviewed that contains only one business man, one professional man, one farmer, and one housewife, would be inadequate; since many unknown and chance factors might affect the data obtained from a single representative of a given group. This might be termed the probability of error due to chance factors. It is a danger inherent in any sampling which is so small that transient and chance factors may easily influence the results obtained.

Procedure. — Since sampling is necessary to make the data practically obtainable, and since the more readily the data are obtained the less adequate, valid, and reliable they are likely to prove, no method of sampling can entirely eliminate the two sources of error defined in the previous paragraph. They can be minimized, however, by the following procedures:

1. Before selecting the sample, list every known factor that is likely to affect the characteristics to be

examined. In the foregoing example of a spelling study, each of the school subjects, personal correspondence, and business letters might be listed as factors likely to affect the pupils' vocabularies. In a study of community uses for English — occupation, social status, and sex might be listed as factors affecting the uses which might be collected from community members.

2. Select individual cases to make up the sample so as to include each of the factors listed in Step 1, in proportion to the relative importance of the factor. In the spelling study, papers might be chosen from each of the school subjects; moreover business and personal letters might also be included. If the errors in personal letters are considered especially important, these letters might comprise the largest part of the sample. In the case of the investigation of community uses for English, representatives might be selected from each type of community occupation, from each type of social status, and from both sexes. Moreover, if housewives and business men are the most common occupation in the community, representatives from these groups might comprise the largest portions of the sample.

3. The individuals selected in connection with each known factor should be selected at random or in accord with a plan that has no relationship to any factors affecting the data to be examined. Thus, in the spelling illustration, a number of papers might be selected wholly at random from each of the school subjects, or

the papers written on Wednesday of each week might be chosen if there were no definite relation between the day of the week and the type of written work. Or in the English study, members from each community group might be selected wholly at random or they might be selected alphabetically, since the alphabetic arrangement of the name is unlikely to have any relationship to the types of English used. Such random selections are likely to equalize the effects of various transient and chance factors. Furthermore, such samples are likely to include representatives of significant factors which are not known to the investigator.

4. Finally, a sufficient number of cases should be chosen to reduce the variations in result which are likely to occur when the samples are small. Knowing the actual variations between individuals in the sample, the theoretical variations between the sample and the whole from which the sample is selected may be calculated mathematically. This is commonly termed the probable error. The amount of this error varies inversely as the square root of the number of cases in the sample; hence increasing the number of cases decreases this error. The adequacy and the reliability of a sample are both partly dependent upon the number of cases selected to make up the sample.

Two factors determine the number of cases which should be selected for the sample. The first factor is the degree of adequacy desired in the data, i.e., in this

investigation how closely need the data obtained from the sample correspond to the similar data which would be obtained from the entire group? In the spelling study, for example, if one wished to secure the 80 most frequently misspelled words to be used as the class spelling list for the month, how closely should the list of 80 words obtained from the sample correspond to the list which might be obtained by checking all of the written work of the pupils? The answer might be, that a difference of 4 or 5 words in the list would make little difference, but about 95% of the 80 words obtained from the sample should be identical with the words obtained from all of the written work. This degree of adequacy desired might well be represented by the per cent of agreement between a given list of data obtained from the sample and the corresponding list which would be obtained if every case were examined.

The second factor determining the number of cases which should be selected for the sample is the degree of variation in the data examined. If the variation in the data is large, more cases need to be included in the sample; while if the variation is small, the number of cases in the sample may be correspondingly less. In the spelling study, if it were found that the same words were frequently misspelled in most of the papers, a smaller number of papers would suffice. When the agreement between individuals is close, the number of individuals required in the sample is small. Unfortunately, the degree of agreement between the indi-

viduals examined cannot be predicted beforehand; hence several cases should be examined before determining the size of the sample.

An accurate formula for calculating the size of the sample required cannot be given even when the per cent of agreement desired and the per cent of agreement between individuals are known, since the size of the whole is a fixed quantity as a rule and the number of items of data desired is usually variable. However, a rough rule of thumb is needed for service studies; otherwise there is no guide for determining the size of the sample required. The following rough, empirical rule was developed by the authors from many service studies: $N = \frac{4a^2}{a1I^2}$, where N signifies the number of cases required in the sample, "a" represents the percentage of agreement desired between the data obtained from the sample and the data which would be obtained from the entire group considered, while "a1I" signifies the average per cent of agreement between the lists of data obtained from pairs of individuals examined.

In the spelling example, "a" was .95 since it was desired to obtain a list of 80 words from the sample, 95% of which would be identical with the list of the 80 most frequently misspelled words counted in all of the pupils' written work. Checking the 80 most frequently misspelled words from one set of papers against the 80 obtained from a second set gave the per cent of agreement between the two individual sets of papers.

Continuing this checking of pairs of individual sets, the average agreement among individuals was found to be 42%, that is "a1I" = .42. Substituting these values in the formula,

$$N = \frac{4a^2}{a1I^2}, \text{ gives } N = 21 \text{ (approximate)}.$$

About twenty-one sets of papers would be required to make up the sample from which to check the misspelled words. It must be remembered that such a formula as this is only a rough approximation, since several mathematical assumptions are involved which are only approximately true in most cases. These assumptions may be distinctly false when the number of items of data to be collected is relatively large and the per cent of agreement is very small.

References. — Examples of sampling may be found in the following type studies and specimen studies:

Defining Objectives. Specimen Studies, No. 2, Step 2; No. 3, Step 1.

Constructing or Reorganizing the Course. Specimen Study, No. 9, Step 1.

Selecting Text Materials. Specimen Study, No. 3, Step 2.

Adapting Prescribed Materials to a Given Class. Specimen Studies, No. 1, Step 1; No. 6, Step 1.

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8. CLASSIFICATION

Classification is a technique that may be extremely simple or highly complex, depending upon the purpose in view and the nature of the date to be classified.

Various techniques have been developed by students of natural science, statisticians, librarians, and others for classifying the data of their respective fields according to categories or headings that have already been accepted. However reliable such techniques may be for investigations in the given field, they have slight application to the problems of teaching for the reason

that acceptable categories have not been defined for the many types of data that the student needs to classify. Examples of such data may be supplied at random — objectives, learning activities, learning difficulties, subject matter of a given course, teaching problems, and many others of equal importance. Hence the technical problems in classifying such data are not adequately met by the techniques so extensively developed in other fields. The problem for students of teaching consists primarily in developing reliable ways of defining headings under which the data may be organized.

General Purpose. — The purpose of classification is to group the given data in whatever manner will make them easier to understand and therefore easier to deal with. This purpose is usually accomplished by placing together the items that are alike, as when a long list of activities performed by pupils is so classified as to show what activities are performed at the same time of day, or at the same place, or for the same ends. Such a list of activities might conceivably be classified on the basis of any factor that has a significant effect upon pupils' school behavior, such as time of day, physical surroundings, attitude, method of work, subject matter to be learned, and the like. The service study very frequently requires the classification of data according to such bases as are important under the given conditions and which may never before have been utilized in organizing similar data.

Types of Data. — As may be readily inferred from the master list of data and from the various tabular analyses, *any* type of data may require classification.

It should be noted in this connection that some types of data are easier to classify than others. The types easy to classify are those for which satisfactory headings happen to have been formulated and published by others, for example, types of major objectives, topical outlines for subject-matter of conventional courses, typical methods of teaching, and criteria for pupils' learning. Since many different lists of headings may be found in professional literature for data of these types and others, the most useful list can only be found by searching through the publications likely to contain them. The advice of persons familiar with such literature will frequently save much time in locating the list most useful to the given study.

Specific Uses. — The uses of classification are many and varied, since the process of combining similar items into larger wholes forms such a large part of any inductive thinking. To identify all the specific uses of classification as a means of solving problems in teaching is therefore an impossible task. It may be sufficient, however, to mention five uses of classification that are frequently made in service studies.

1. The first and probably the most common use is to organize a random list of items in logical form in order that the items may be more readily evaluated

or selected according to certain criteria, as in constructing a check list. This use of classification is involved in preparing a list of the desired outcomes of instruction in a given course, a list of pupil activities, a list of unit topics, or lists of other data in order that competent judges may indicate the relative importance of the items or select the few items most useful for a given purpose.

2. Classification is also necessary in comparing data of the same type that are obtained from different sources. If, for example, one wishes to compare the causes of pupils' illness in two or more school communities, it is necessary to classify the illnesses of each community with reference to the same list of causes in order that the relative frequency of each cause in each community may be apparent.

3. A closely related use consists in classifying the given data according to a determined list of headings in order to discover under how many and what headings the various items fall. An obvious illustration of this use is the check of pupils' class records to determine the distribution of failures by subject and course. In this case the courses offered by the school constitute the headings and the individual failing pupils are the data to be classified. Other examples will be found in the procedures outlined throughout this volume such as securing the facts with regard to the same unit of subject matter occurring in different courses, the same learning difficulties confronting dif-

ferent pupils, the same teaching problems arising in different classes, and the like.

4. Another use of classification is frequently described as analysis. This consists in preparing a complete list of the items that relate to a single heading. Assume, for example, that a teacher wishes to determine the more significant errors made by pupils in attempting to apply a given rule or principle. It might well be more satisfactory to classify a representative group of errors according to all the principles involved than to seek only the errors relating to the one principle in question. Classification is thus frequently used as a means of selecting data on a given topic from other data of the same category.

5. A fifth use of classification represents the other type of analysis which seeks to define inductively the important sub-divisions of a given topic. The investigator might wish, for example, to analyze the procedure known as "supervised study" into its major functions. A convenient method of defining the functions would be to collect from observation all the activities performed by teachers of the particular subject when pupils' study is being supervised. A classification of the activities according to type might then indicate the major functions. A more detailed illustration of this use will be found in the type study outlined for Problem I A, pp. 84 ff.

Criteria. — The value of any particular classification is of course dependent upon the use to be made of it

and the results that follow its use. There are, however, certain formal criteria that apply to any classification. These may be briefly mentioned.

The first quality of any logical classification is *discreetness*, that is the distinction between the various headings and sub-headings. The classification lacks discreetness when it is not immediately apparent to the reader that the various items *belong* under their respective headings and under no other headings. It is helpful to think of each heading in a classification as defining the items placed under it. That is to say, the items placed under a heading, (a) must apply to that heading, (b) must apply to no other heading, and (c) must make the meaning of the heading entirely clear. Examples of classifications that may be called discreet are found on pages 127, 133, and 446.

In the service studies with which we are concerned it is often necessary, however, to classify data according to particular headings that are not discreet, as when units of subject matter are classified according to different objectives, pupils' interests according to different subjects, or teachers' methods according to different problems in learning. In these cases the same item may properly appear under several headings; sometimes, perhaps, under all. While such a classification is not discreet, it may, however, have the quality of *completeness*, which for certain purposes is more important. Except where the classification is purely formal — as in an alphabetical dictionary or a table

of chemical elements — it is uncommon for the same classification to be both complete and discreet. It would be impossible, for example, to make a discreet classification of all the words in the dictionary according to their meanings. The more formal the classification, the more discreet it may be. The more the classification is based upon the functions or the use of the items in life situations, the more completeness is desirable and the more difficult it is to make the classes discreet.

The conflicting criteria of completeness and discreetness may be reconciled by a third criterion; namely, *adequacy*. A classification is adequate when it is sufficiently complete to cover all significant items of the given category and when it is sufficiently discreet to be readily understood. The classification shown in the type studies are believed to be adequate for the purposes each is intended to serve.

Procedure. — We have here to suggest the major steps involved in classifying any type of data. In order that the steps may be no more abstract than necessary, it will help to suggest a concrete application of each. The steps are accordingly illustrated as applied to the classification of a list of pupils' disciplinary offenses. It is assumed that the offenses have been reported by teachers without reference to any particular types.

Before the actual task of classification is begun it is desirable to write each item on a separate card of con-

venient size. When the number of items is large, the carding is essential. Space should be allowed for underlining or checking words and for the placing of symbols. Stiff cards are more satisfactory than slips.

1. The first step involves a decision as to the purpose of the classification. This is usually apparent from the objective of the study as a whole or from the statement of the original problem. For example, the disciplinary offenses might be classified for a number of different purposes — such as, to define problems for research in the field of class management, to prepare a check-list whereby to determine which offenses are considered the more serious, or to discover the different ways in which teachers report offenses of the same type.

2. The next step is to select the basis upon which the headings shall be organized. This is, of course, the most essential and most critical step, since a wrong selection involves an entire re-classification upon some other basis. It is usually wise, however, to list the possible bases and to experiment with each in order that the most satisfactory may not be overlooked. The considerations involved in making such trial classifications may be mentioned separately.

a. The first consideration is a decision between a formal basis and an abstract basis. This depends directly upon the purpose to be served. The formal basis is objective, more mechanical, and more discreet than the abstract basis. The abstract basis, however,

is more useful when the purpose is to reveal some particular implication of the data. For example, the following formal and abstract bases might be used in classifying disciplinary offenses.

FORMAL BASES	ABSTRACT BASES
important nouns contained in the written descriptions of disciplinary offenses — such as noise, discourtesy, anger, indecency, etc.	pupils' motives and traits implied — such as desire for recognition, disobedience, dislike for teacher, lack of home training
	pupils' activities involved — such as speaking insolently to teacher, defacing school property, cheating in tests.
important verbs — such as whispering, cheating, deceiving, defacing, etc.	school regulations involved — such as rules for passing on stairways, fire drill regulations, rules for behavior in study hall, on field trips, etc.
parts of school premises in which offenses occur — such as classroom, playground, study hall, corridors, laboratories	persons toward whom the offense is committed — such as other pupils, classroom teacher, other teachers, principal, et al.

b. After one basis has been selected as the most satisfactory, whether formal or abstract, the *primary or main headings* may be developed on that basis.

That is to say, if it is decided to base the classification upon the motives or traits implied in the pupils' offense, the cards would be thrown in piles according to the motive or motives inferred from each act reported. If the attempt to group the cards according to motives proved unsuccessful, because of difficulty in ascribing various acts to particular motives, another basis such as the pupils' activities might be tried out until a workable basis is found.

c. When the primary headings have been developed, the next consideration is the secondary or sub-headings. Where the amount of data is large, these may be developed in the same way by experimenting with the other bases not utilized. When the data are few, it is more satisfactory to classify the items under each main heading separately, according to the divisions into which each group most easily falls. The same advice applies to the selection of third level headings.

3. The next essential step is to determine the degree of detail to be shown in the classification. This question is particularly important in classifying such data as pupils' disciplinary offenses, language errors, and the like, since the details are often merely useful to distinguish the principles or types involved, and may be omitted when the desired headings have been submitted.

A safe rule here is to make experimental classifications of some one topic, carrying the surbordination of headings as far as necessary to include all the data

relating to the topic. When this has been done, it becomes possible to estimate the value of each level for the given purpose, beginning with the lowest levels on which the items are most detailed. The levels that are too detailed to be significant may then be omitted in classifying the data as a whole. For example, in classifying the disciplinary offenses related to defacing property, it is probably unnecessary to specify the kinds of property defaced beyond mentioning the principal types such as furniture, walls, sidewalks, books, and the like. Furniture would not need to be analyzed into different kinds of desks, chairs, lockers, etc., although these specifics may appear in the original data.

4. Having determined the primary and secondary sub-headings and carried out the classification to the point where the items are no longer significant, the next step involves the preparation of codes. This step is not necessary except when the data contain a large amount of detail. The code is a list of items belonging to the same category, all of which may be applied to several different topics of the running classification.

For example, assume that the data regarding disciplinary offenses are classified first under the type of activity performed by the pupil — such as whispering, cheating, stealing, etc. — and then further classified according to the pupils' motives involved — such as to attract attention, to get even with the teacher, to avoid work, etc. There would be many other groups

of related items contained in the data. Yet to include these related items would tend to complicate the classification without making the separate topics any clearer. Such data are suggested by the bases mentioned in Step 2a, such as school regulations violated, parts of school premises on which the offense is committed, persons toward whom the offense is committed, times of day, and the like. These should consequently be listed separately as codes.

It is usually more satisfactory, when the amount of detail is large, to omit such items from the classification and simply list the items separately for each category as Code A, Code B, Code C, etc. Each topic that is related to one or more codes may then be followed by a symbol referring the reader to the code if more detail is desired. Otherwise the topics may be read more easily when relieved of the code material.

5. A final step may be mentioned which, like the preparation of codes, is often unnecessary in classifying the data involved in service studies. This step consists in using the code material to check the completeness of the running classification. For example, if the topic "cheating" is followed by a list of motives that lead pupils to cheat, it is important that the list of motives be complete. After the motives have been listed that are suggested by the cards grouped under cheating, it may well be that certain important motives have been omitted. In this case, the codes may serve to suggest the omissions, if the items of each code are

checked against the doubtful topics. By thinking about cheating done in the presence of each type of pupil and school official, for example, certain important motives for cheating may be suggested that were not reported by the teachers who supplied the original data.

References. — Examples of classification may be found in the following type studies and specimen studies:

Defining Objectives. Type Study, Steps 2, 4, 5, 6; Specimen Studies, No. 3, Step 3; No. 5, Steps 3, 5; No. 7, Steps 3, 5; No. 9, Step 6.

Constructing or Reorganizing the Course. Specimen Studies, No. 1, Step 3; No. 3, Steps 1, 3; No. 4, Steps 2, 8; No. 5, Step 2; No. 6, Steps 1, 2; No. 8, Steps 5, 7.

Selecting Text Materials. Specimen Studies, No. 2, Step 2; No. 6, Step 4.

Adapting Prescribed Materials to a Given Class. Specimen Studies, No. 1, Step 4; No. 5, Steps 1, 2; No. 6, Steps 2, 4; No. 7, Step 3; No. 8, Steps 1, 2; No. 9, Step 1.

Selecting Learning Procedures. Type Study, Steps 2, 4; Specimen Studies, No. 1, Step 3; No. 2, Step 1; No. 5, Step 2; No. 6, Step 2; No. 8, Steps 2, 4; No. 9, Step 2.

Constructing Exercises and Direction Sheets. Specimen Studies, No. 2, Step 2; No. 3, Step 2; No. 3, Step 2; No. 4, Step 3; No. 7, Step 2; No. 9, Step 2; No. 10, Step 2.

Motivating. Type Study, Step 5; Specimen Studies, No. 1, Step 4; No. 3, Step 2; No. 8, Step 6.

Testing. Specimen Studies, No. 2, Step 1; No. 9, Step 1.

Grading and Sectioning Pupils. Type Study, Step 2; Specimen Studies, No. 1, Step 2; No. 2, Steps 2, 3; No. 3, Steps 3, 4; No. 4, Step 6; No. 5, Step 5.

Managing a Class. Type Study, Steps 1, 2, 3; Specimen Studies, No. 1, Step 4; No. 2, Steps 2, 6; No. 7, Step 4; No. 8, Step 3; No. 9, Steps 2, 4; No. 10, Step 2; No. 11, Steps 2, 3.

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9. SUMMARIZING

The act of summarizing a collection of unorganized data is performed so casually in everyday conversation and correspondence that it scarcely deserves to

be listed as a formal technique. In reporting the findings of research, the summary presents little or no difficulty, since one has merely to throw the conclusions of the study into paragraph form. In the service study, however, the process of summarizing has considerably greater significance and is more likely to cause difficulty. The reason for the difference is that in the service study the investigator himself must often select data arbitrarily. In the research this selection is carefully controlled. In the service study, it is often largely subjective.

The teacher's own judgment concerning what is useful under the given classroom conditions is often more reliable than the judgment of other individuals. For example in summarizing a collection of methods for helping pupils to discover misspelled words, the teacher would be influenced by his personal judgment regarding the relative merits of the methods as applied to the classes concerned. Hence in the service study the essential problem of summarizing is how to avoid serious errors of personal judgment in making decisions after the necessary data have been gathered. Summarizing thus closely resembles the technique of individual evaluation, as discussed in the following section.

General Purpose. — So considered, it is clear that the purpose of summarizing is simply to organize the data in whatever ways are most useful to the given problem, without taking the time to determine their

organization by systematic experiment. This purpose is entirely legitimate, since the teacher or administrator who conducts the service study is in a majority of cases the final judge of its success.

Types of Data. — Any types of data may be summarized except perhaps data consisting simply of figures, as in a series of test scores. In this case the process of summarizing is called tabulation. The investigator decides what implications of the figures he wishes to bring out and then makes his tabulation accordingly. However, since the arrangement of figures by tabulation is usually a simple matter in the service study, we shall describe summarizing as applied to data that are expressed in words, phrases, or sentences.

The tabular analyses show that summarizing applies chiefly to data of four types; namely, (1) lists of activities — including pupils' activities in class, in school, at home, and in the community at large; also to the activities performed by various groups of adults in the community; (2) lists of difficulties met by pupils in school work, in social activities, and in other situations of daily life; (3) test papers and other written statements indicating pupils' abilities, preferences, and traits; and (4) suggestions regarding methods of meeting various teaching situations.

Specific Uses. — Data of the foregoing types may be summarized so as to bring out whatever implications the investigator wishes to emphasize. Lists of

pupils' home activities, for example, may be summarized by selecting those activities which relate directly to the work of a given course, or those that show how much responsibility the pupil is given for home chores, or those that suggest interesting things to do in school. Similarly a list of pupils' difficulties may be summarized with reference to their relative importance, their relation to different subjects, and other implications. It is thus apparent that summarizing has much in common with classification and with evaluation. The difference consists in that a summary of the data may suggest many forms of classification or evaluation that reveal different implications. The summary differs also from systematic evaluation in that the final selection of items is made according to the independent judgment of the investigator.

For example, let us assume that a first-grade teacher has collected a variety of data from several sources with a view toward grouping pupils for appropriate instruction in reading. There are 45 pupils in the class. From the data at hand the teacher may group the pupils, with respect to some significant factors: nationality, age, intelligence, extent of pre-school training, desire to learn to read, present reading ability, speed of mental reaction, or many others. It is clear that any normal first-grade class will represent such a range with respect to any one of these factors and that the factors will overlap to such an extent as to discourage the teacher from grouping the pupils accord-

ing to any single factor. Furthermore, the experience of other first-grade teachers with different bases of grouping is not reliable unless the given teacher is able to employ the same methods in working with various groups and unless the given class contains approximately the same proportion of pupils of each group.

In such a situation it is apparent that the teacher concerned must summarize the data separately with respect to each factor that is significant in the solution of the given problem; that is, with respect to factors that are significant in teaching these particular pupils to read. He must use his judgment as to the characteristic which it is most important for the pupils of each group to have in common. It may be that the foreign pupils present problems of instruction which require them to be grouped separately. It may be that the repeaters should form another group, and the pupils who already know how to read, a third. But the summary of the data can only be effective when it represents all promising uses of the data as applied to the conditions at hand.

Criteria. — The foregoing example suggests the criteria that govern the making of useful summaries. For one, the summary must represent an evaluation of the data with reference to the problem to be solved. That is to say, the summary must be *pertinent* to the objectives of the study.

A second criterion is *clearness*. Since the function

of the summary is to emphasize all promising applications of the data, clearness is best achieved by devoting a single paragraph or section of the summary to each type of application. For example, the data concerning the first-grade pupils would be described or presented first with reference to the pupils' present ability to read. Such questions would be discussed as — what are the characteristics and what is the proportion of children who are not yet ready to learn to read, of children who are ready to learn to read, of those who have learned to read one primer, and of those who can read a first reader. Another section of the same summary might describe the data with respect to the types of home from which the children come — what are the characteristics significant for reading ability of the children whose parents are college graduates, high school graduates, elementary school graduates, and the like. In this way, the various implications of the data as a whole may be clearly set forth.

A third criterion is *brevity*. To review all the data in the manner suggested in the foregoing paragraph will serve to present the data clearly, so far as the various implications are concerned. Yet, the purpose of bringing out the implications is to simplify the problem of selecting and combining them to best advantage. In other words, a good summary makes it possible to obtain a correct perspective of the data. It is for this reason that brevity is important. The investigator

must make the best compromise he can between emphasis of the few most important implications and attention to details that may imply significant meanings not apparent on the surface. When the data are expressed in words rather than in figures, the need for brevity usually justifies a considerable sacrifice of detail in order to restrict the summary to a half dozen paragraphs or so with preferably no more than four or five short sentences in a paragraph.

Procedure. — 1. Prepare a definite statement of the uses that might be made of each type of data collected. For example, if data have been collected to show the nationality of first-grade pupils as a means of grouping them appropriately for instruction in reading, such uses as the following might be stated for data of this type: To identify the pupils who speak foreign languages at home and who must be taught to speak English before they are taught to read it; to determine the number of foreign born pupils of each nationality on the chance that some national groups have peculiar needs; to study the particular difficulties in learning to read English that may result from early familiarity with a foreign language, and others.

2. Examine the uses stated for all types of data collected and select the more important uses. This selection should be based not only upon the adequacy of the data but should represent a careful consideration of the teaching problem and of the school and classroom conditions that determine the success of any

teaching procedure. For example, the local conditions may permit the teacher to form several small groups within the class and work with all groups simultaneously; that is, she may assign appropriate tasks to each group without giving so many minutes to each by dividing up the reading period. In this case a larger number of uses would be selected, since the larger number of groups permits more of the data to be utilized in selecting the groups. If, however, the teacher must give twenty minutes exclusively to each group for instruction in reading, only about three groups can be formed and hence fewer uses can be made of the data for purposes of grouping.

3. Having selected the appropriate uses of each type of data, determine what uses are common to various types — that is, determine the types of data that may be used in the same way. This may usually be done by inspection; otherwise other teachers or experts who are sufficiently familiar with the actual teaching situation should be asked (by interview or correspondence) for advice in making the most efficient use of the data.

4. Prepare brief paragraphs concerning each of the uses selected, setting forth the essential facts contained in the data. For example, the data regarding first-grade pupils serve the primary purpose of distinguishing different degrees of readiness for instruction in reading. The paragraph or section devoted to readiness might then present the facts regarding age, nationality, intelligence, and other types of data that

apply to this factor of readiness. Other uses might then be similarly treated in turn.

References. — Examples of this technique may be found in the following type studies and specimen studies:

Defining Objectives. Type Study, Step 3; Specimen Studies, No. 2, Step 3; No. 5, Step 5; No. 8, Steps 1, 2, 3; No. 9, Step 6.

Constructing or Reorganizing the Course. Specimen Studies, No. 4, Step 2; No. 5, Step 5; No. 7, Step 2; No. 8, Step 4; No. 9, Step 3.

Selecting Text Materials. Specimen Studies, No. 2, Step 2; No. 6, Step 4.

Adapting Prescribed Materials to a Given Class. Specimen Study, No. 6, Step 3.

Selecting Learning Procedures. Specimen Studies, No. 1, Step 3; No. 3, Step 3; No. 4, Steps 1, 2; No. 8, Step 4; No. 9, Step 4; No. 10, Step 3.

Constructing Exercises and Direction Sheets. Specimen Studies, No. 9, Step 4; No. 10, Step 3.

Motivating. Specimen Studies, No. 3, Step 5; No. 8, Step 3.

Testing. Specimen Study, No. 1, Step 4.

Grading and Sectioning Pupils. Specimen Studies, No. 1, Steps 2, 6; No. 3, Step 4; No. 4, Steps 1, 5; No. 5, Steps 3, 5.

Managing a Class. Type Study, Steps 2, 3; Specimen Studies, No. 1, Steps 3, 4; No. 3, Steps 3, 6; No. 5, Step 2; No. 8, Step 4; No. 9, Steps 2, 5.

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10. EVALUATION

The techniques of evaluation apply to any service study. Since the process of determining relative values requires various standards of value and certain personal elements, the methods of evaluation are correspondingly many and varied. In selecting a set of supplementary readers, for example, a teacher may make a merely personal judgment, or she may compare certain selected features, or obtain the judgments of other teachers, or develop more or less elaborate devices for measuring selected features of the books objectively. The types of evaluation used in service studies are limited, however, by the need for simplicity and by the time available. Hence the following sections describe six techniques of evaluation: *individual judgment, group rating, comparison, space and frequency counts, testing,* and *experiment.*

These techniques are not entirely distinct. Comparison, for example, may involve testing, group rating may involve comparison, experiment may involve test-

ing. Furthermore, the list does not include all techniques which might be used for purposes of evaluation. The list does comprise, however, the relatively simple methods which are highly useful in the investigation of a wide variety of service problems.

General Purpose. — Although evaluation may be defined as the process of determining relative values, the purpose of any evaluation in a service study is to select from several items of collected data those most appropriate for a given use. A teacher who has collected several different methods for increasing the speed of reading among fourth-grade pupils makes an evaluation by selecting the methods most appropriate for the class. Pupils' needs for specific instruction and practice in "carrying" in arithmetic addition are evaluated by determining the relative skill of each member of the class. This might require testing, comparison, or individual judgment. In preparing a list of history references for a given unit, an evaluation is made of the available references in order to list those which are most appropriate for the unit and for the class. Thus all types of evaluation have in common this general purpose of selection.

Types of Data. — Any type of data may be evaluated. The practical questions are whether the data need evaluation and if so, what technique is most efficient. In case all the data collected are essential to the purposes of the study and no distinction needs to be made among them for emphasis or priority of use,

evaluation is unnecessary. Thus an attempt to determine which steps are most important in solving an arithmetic problem in percentage is obviously unnecessary if all of the steps must be performed before the problem can be correctly solved. Whenever all of the data collected are appropriate and essential for the given use, no evaluation is needed.

Choosing the Technique of Evaluation. — On the other hand, when it is necessary to select certain items of data, choice of the best method of evaluation is a question of real importance. For example, in reconstructing an English course one may have collected a number of objectives proposed by authorities on the teaching of English. There may be too many objectives to develop in the time available for the course, furthermore some of the objectives may be mutually incompatible or contradictory. How shall the objectives most appropriate for the course be selected from the list? Shall the investigator express his own personal opinion — individual judgment? Or shall he compare the list of objectives with a list of community English activities, selecting the objectives related to the activities — the technique of comparison? Or shall he select the objectives most frequently given in books — the frequency count technique? Or shall he submit the list to a number of English teachers for their combined judgments — group rating? Or shall he select the objectives to which most space is given in English textbooks — the space count technique? Or

shall he devise tests for the attainment of each objective, give the tests to his class, and select for his course those which have not been attained by the class — the technique of testing? Or, finally, shall he devise an experiment for measuring the value of each of several objectives with reference to the major objectives for the entire English curriculum? Any one of these techniques or a combination of them might conceivably be used for evaluation in such a study.

There are five factors which need to be considered in choosing the technique of evaluation to be used in a given study. These are, (1) the data to be evaluated; (2) the criterion by which the data are to be evaluated; (3) how widely the results are to be applied; (4) the degrees of refinement necessary in the measurements; and (5) the facilities available, including materials, time, and personal assistance. By considering the five factors in connection with a given study, a choice of technique can be made with some precision.

11. Individual Judgment[1]

Types of Data. — An examination of the tabular analyses reveals the fact that individual judgment is used with more different types of data than any other method of evaluation. In fact, any collected items of data may be and usually are evaluated by the personal judgment of the investigator. However, in a good

[1] See also the discussions of *Summarizing* in the preceding section and of *Group Rating* in the following section.

service study it is rare to find this the only method of evaluation used, since the method has obvious limitations. Individual judgment is most helpful in connection with data of a personal character or of such a complex nature as to make exact comparison or testing difficult. Educational objectives, learning activities, traits, problems, interests, teaching methods, course topics, and illustrations are thus the most common types of data requiring individual judgment. Supplementary techniques, however, should be used whenever possible.

Specific Uses. — As previously remarked, this method is most useful in selecting appropriate items from a list of data of a personal or complex character. Thus, when a teacher has found several successful methods of overcoming a teaching difficulty, his own preference is one important basis for selection. Individual judgment also has a place in determining the relative value of various interests manifested by pupils, in selecting the learning activities to be taught, in determining the relative value to a given class of various educational objectives, and the like.

Furthermore, this technique is commonly used when the criterion by which the data are evaluated is such that objective measurements are difficult or impossible. "Importance" is a good example of such a criterion. Unless importance is defined in terms of more specific elements it must be measured by judgments. Enjoyment, interest, and success are other examples. Indi-

vidual judgment is commonly used in selecting more important topics, most enjoyable activities, most interesting books, most successful teaching methods.

Another common use of this method is in connection with the selection of data to be used only in one's own classroom. Individual satisfaction is primary in a service study to overcome individual difficulties. On the other hand, one's own evaluation would be inadequate when the findings are to be used in several classrooms.

Individual judgments are especially necessary when facilities (including time, assistance, and materials) are inadequate for more objective measurements. For example, careful experimentation is most desirable in selecting reading materials, but commonly in service there are not funds to secure many materials for trial. There is insufficient assistance to set up the necessary experimental controls. Furthermore, teachers rarely have enough time to plan and conduct such an experiment. Hence, individual judgments are often used in selecting reading materials.

Criteria. — An individual judgment essentially involves comparing items of data with some standard to determine the relative degree to which each item meets the standard. Hence, it is desirable that the standard or criterion be *clearly and explicitly defined*, that the items of data be *specific* rather than general, and that the individual be *familiar with the characteristics* of the data which he is to evaluate. Furthermore, although

simplicity is a chief quality to recommend this technique, it should be as *reliable* as possible, and it should be used to supplement other methods of measurement which would otherwise be inadequate. Therefore *adequacy* is also a criterion.

Procedure. — The first step in making any evaluation is to select the technique to be used. This has already been described in the preceding section. This step also involves choosing the criteria to be used in evaluating the data, a selection depending upon the nature of the data, and the character of the study. If the technique of individual judgment is chosen, the following steps may be followed:

1. Make certain that the items of data are specific enough to be evaluated with some precision. Thus, the relative importance of "effective oral expression" compared with "fluency in written work" as English objectives, would be difficult to determine since both objectives are so general. On the other hand, "conversing in an interesting way with friends" might be more easily compared with "writing concise descriptions" since they are both more specific. If the data are not sufficiently specific, they should be analyzed until their specific implications are revealed.

2. Define each criterion as clearly and explicitly as possible. Unfortunately, many criteria cannot be defined very explicitly. For example, the criterion "importance" applied to objectives is rather difficult to define farther than "the relative importance to society

and the individual of having pupils attain this objective." On the other hand, the criterion "common" when selecting common community English activities may be defined more explicitly as two sub-criteria, viz.: (1) the relative number of persons in the community performing each activity, (2) the relative amount of time spent by community members in performing each activity.

3. Make certain that the one to make the evaluation is familiar with the characteristics of the data to be measured. In selecting common community English activities, one who is unfamiliar with the daily activities of community members could not give useful judgments.

4. When practicable, make the evaluation by comparing each item of data with a standard and with one another. That is, rate the items of data and rank them also. This makes for greater reliability. Thus, it might be helpful to rate the English objectives as "very important," "important," "unimportant," "undesirable," then go through the list ranking the objectives in order of importance. This double evaluation makes the results somewhat more reliable. As one goes down the list it becomes increasingly difficult to rank the less important items of data, but it is also less necessary.

5. When possible, combine individual evaluations with other more objective measurements of the data. The greatest weakness of this method is its subjectivity.

It is likely to be greatly affected by personal biases, idiosyncrasies, and inadequate bases for judgment.

References. — Examples of evaluation may be found in the following studies and specimen studies:

Defining Objectives. Type Study, Step 3; Specimen Studies, No. 4, Steps 4, 5; No. 8, Step 5; No. 9, Step 4.

Constructing or Reorganizing the Course. Specimen Studies, No. 3, Step 1; No. 4, Steps 1, 2, 3, 5, 6, 7; No. 5, Steps 5, 7; No. 6, Steps 1, 2; No. 7, Steps 5, 6; No. 8, Steps 4, 5, 6, 7; No. 9, Step 3.

Selecting Text Materials. Specimen Studies, No. 3, Step 4; No. 4, Steps 2, 3, 4; No. 5, Steps 3, 7, 8, 9; No. 6, Steps 6, 7.

Adapting Prescribed Materials to a Given Class. Specimen Studies, No. 2, Step 1; No. 4, Steps 2, 3, 4; No. 6, Step 3; No. 10, Steps 4, 5, 6.

Selecting Learning Procedures. Specimen Studies, No. 1, Step 3; No. 4, Step 2; No. 7, Step 3; No. 8, Steps 1, 3.

Constructing Exercises and Direction Sheets. Specimen Studies, No. 1, Step 2; No. 5, Step 2; No. 6, Step 3; No. 8, Step 3; No. 9, Steps 3, 5; No. 10, Step 1.

Motivating. Type Study, step 3; Specimen Studies, No. 2, Step 1; No. 3, Step 2; No. 4, Steps 4, 5; No. 6, Step 6.

Testing. Type Study, Steps 1, 2, 3, 4, 5; Specimen Studies, No. 1, Steps 1, 2; No. 2, Step 2; No. 3, Step 1; No. 4, Steps 3, 4; No. 5, Steps 1, 3; No. 6, Step 1; No. 9, Steps 2, 3, 4, 5.

Grading and Sectioning Pupils. Type Study, Step 1; Specimen Study, No. 1, Step 5.

Managing the Class. Specimen Study, No. 10, Step 5.

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12. GROUP RATING

Group rating is essentially a combination of several individual judgments, hence the reader should refer to the preceding section for much of the discussion is applicable here. If the group rating is to have value,

it is essential that each person in the group make a careful *individual judgment.* A group rating made by combining many careless individual judgments is of much less value than a rating made by combining a smaller number of carefully considered judgments.

Types of Data. — The same types of data may be evaluated by group ratings as by individual judgment. The group method is particularly valuable when applied to pupils' interests, attitudes, ambitions, and similar types of personal data which are subjective in character and hence must be obtained from persons, either directly or indirectly. For example, the interests of children in various types of stories have often been determined by reading different stories, then asking the class to rate the stories by indicating whether they were greatly enjoyed, disliked, or neither. The checklist, *Student Opinion on War,* a portion of which is reproduced on pp. 549 ff., illustrates the use of group rating in determining students' attitudes.

Of course, this technique is often used to obtain other types of data than the personal reactions of pupils. As listed in the Tabular Analyses, group rating is commonly used to evaluate objectives, activities, traits, problems, interests, course topics, lists of materials, abilities of pupils, pupil difficulties, methods of overcoming difficulties, test items, and pupils' methods of work.

Specific Uses. — Group rating is used together with individual judgment when the data are of a personal

or complex character, when the criterion makes objective measurements difficult, and when facilities of time and assistance discourage objective measures. But whereas individual judgments are especially useful when the results are to be applied in a single classroom, group rating is useful when the results are to be applied by several persons. For example, in selecting English objectives to be used by one teacher, individual judgment of those most needed by his own pupils might be quite significant; on the other hand, if the objectives are to be used by several teachers, group rating would be preferable.

The chief advantage of individual judgment is its simplicity. Its chief drawback is the danger of individual biases, prejudices, and lack of precise judgment. Group ratings, however, though less simple than individual judgment, are less subject to the variations in judgment due to biases and prejudices which are purely individual and are not possessed by the group as a whole. Even variations due to lack of precise judgment may be reduced when they are not constant but occur here and there by chance.

Criteria. — The criteria applicable to individual judgments are also applicable to group rating, with the difference that *simplicity*, which is of primary importance in individual judgment, is less significant in group rating, while *reliability* is more important in group rating. To obtain mere off-hand judgments, carelessly made, which give one group result today and another

tomorrow, is not acceptable. The technique must be so *reliable* that the findings of the study are not significantly different when a similar group evaluation is repeated. Obviously too, the ratings should be *valid*, that is, the judgments should be made by those who are familiar with the data and will give frank and honest responses. Hence in utilizing the technique, seven factors should be considered: (1) the criterion by which the data are evaluated should be clearly and explicitly defined; (2) the items of data should be as specific as possible; (3) each member of the group must be familiar with the characteristics he is to evaluate; (4) each member of the group should give honest judgments to insure some validity; (5) the technique should be as simple as possible without sacrificing the necessary reliability; (6) other methods of measurement, when possible, should be used to supplement this consensus so that the evaluation may be adequate; (7) the technique should be so reliable that the findings are not significantly affected when the group repeats the evaluation.

Procedure. — 1. Make certain that the items of data to be evaluated are specific. This step was described in connection with individual evaluation.

2. Define the criterion to be used as clearly and as explicitly as possible.

3. Decide on the scale of ratings to be used and define them clearly, using concrete illustrations to make them explicit. In the *Commonwealth Teacher-*

Training Study consensus was used in evaluating teaching activities. Several tests were made in order to select the scale of ratings to be used. It was found that from three to five ratings were sufficient. Thus, in rating *importance* four ratings were provided, viz., very important, important, unimportant, undesirable. Furthermore, in this study it was found that the group ratings were slightly more reliable when each item was rated directly than when a master scale was used.

In defining a rating scale, it is essential that it be continuous so that no gaps appear. Thus, in rating frequency, *very frequent* might be defined as "once or more a week," *frequent* as "from once a week to once a month," *infrequent*, "from once a month to once a year," *very infrequent*, "less than once a year." This scale is continuous, but if *very frequent* were defined as "once or more a day" and *frequent* as "from once a week to once a month," the scale would be discontinuous, since the frequency from once a day to once a week is omitted from the scale.

4. Select the persons who are to make the evaluations. Three factors need to be considered in this selection. In the first place, each person should be familiar with the characteristics of the data to be rated. In the second place, choose persons who are likely to take the time to check the list carefully. In the third place, if not all of a given group are to check the list, select a sample which will be representative

and whose ratings will be reliable. (See Section 7, for a description of the technique of Sampling.)

5. Prepare an introductory explanation which will win the cooperation of those who are to rate the items and which will stimulate them to make honest and careful judgments. (See Section 6, Check-list.)

6. Prepare the items of data, the criteria clearly defined, the introductory explanation, and the directions in tentative check-list form. (See Section 6, Check-list.) Have several persons similar to those who are to rate the check-list read the tentative form and suggest needed modifications. Especially have them note the definitions of the criteria and the rating scale, the directions for recording the evaluations, and the introductory explanation.

7. Make any modifications found to be desirable from the trial with the tentative check-list.

8. If possible, get from each member of the group a promise to assist in making the evaluations before sending the check-lists. Personal interviews are more effective in this connection than letters. In case there is no good reason for making replies — such as friendship, influential school officials, or desire to learn the findings — many check-lists will not be filled out. The mailing list should be large enough to cover this contingency. A return of 60% may be expected from persons who have previously agreed to make returns, as against 20% when no consent has been given.

9. Send the check-lists to the group.

10. When the lists are filled out and returned, tabulate the total number of each kind of rating for each item of data.

11. Transfer the ratings into a single score for each item. Unless the ratings are very uniquely distributed, very little error is involved in giving zero for the lowest rating, 1 for the next rating, 2 for the next, and so on. (See *Commonwealth Teacher Training Study*, "Directions for use of the check-list."[1]) Thus, suppose that twenty-five teachers were rating the importance of various English objectives on a scale of: very important—important—unimportant—undesirable. Assume, that the tabulation of the returns from the twenty-five teachers revealed the following ratings: 1 undesirable; 3 unimportant; 19 important; 2 very important. This would give a score of 1 x 0 and 3 x 1 and 19 x 2 and 2 x 3, a total of 47 points. Now suppose another objective was rated: 2 undesirable; 14 unimportant; 6 important; 3 very important, a total of 35 points. By consensus the first objective was rated more important than the second. This scoring thus serves to obtain a consensus of individual ratings.

12. When sampling is used and when reliability is important, determine the reliability coefficient of the group scores. Usually the reliability may be increased by increasing the number of judges, by making the items of data more specific, by defining the criterion more explicitly, by making the directions clearer, or

[1] Published by University of Chicago Press.

by selecting judges who are less likely to be careless in their judgments.

References. — Examples of group rating may be found in the following type studies and specimen studies:

Defining Objectives. Type Study, Step 3 b; Specimen Studies, No. 1, Steps 4, 5, 7, 8; No. 4, Step 2; No. 6, Step 4; No. 9, Steps 1, 3.

Constructing or Reorganizing the Course. Type Study, Steps 3, 3a; Specimen Studies, No. 1, Steps 3, 4; No. 4, Step 3; No. 5, Steps 3, 4, 5; No. 7, Steps 4, 5; No. 8, Steps 3, 4.

Selecting Text Materials. Specimen Studies, No. 1, Steps 3, 4; No. 2, Steps 2, 3; No. 6, Step 5.

Adapting Prescribed Materials to a Given Class. Specimen Studies, No. 2, Step 2; No. 5, Steps 2, 5; No. 7, Steps 2, 4, 5; No. 8, Steps 3, 4; No. 9, Steps 2, 3, 4.

Selecting Learning Procedures. Specimen Studies, No. 1, Step 4; No. 2, Steps 4, 5; No. 4, Step 3; No. 7, Step 4.

Constructing Exercises and Direction Sheets. Specimen Studies, No. 1, Steps 3, 4; No. 3, Step 2; No. 6, Step 5; No. 10, Step 2.

Motivating. Specimen Studies, No. 2, Step 2; No. 5, Step 4.

Testing. Specimen Studies, No. 2, Step 2; No. 6, Step 1.

Managing the Class. Type Study, Step 1; Specimen

Studies, No. 2, Step 6; No. 5, Steps 1, 2; No. 8, Step 3; No. 10, Step 4.

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13. Comparison

All relative evaluation is a species of comparison. Hence this technique, broadly interpreted, includes the others. However, comparison is commonly used to find relationships among several items of data. Thus, a list of English objectives may be compared with a list of common community English activities to select the objectives useful in community life. Test results in reading may be compared with records in other school subjects to determine whether reading deficiencies cause failures in other subjects. We shall here restrict comparison to the processes involved in determining relationships between two or more sets of data.

Types of Data. — The Tabular Analyses show that nearly all types of data are compared, but the important question is "what types of data should be compared for the purposes of a given study." The types of data to be compared can be selected only in terms of a given problem. However, certain types of data have significant relationships for problems in general. The most important of these are as follows:

Major Types of Data Compared

1. Objectives with pupils' activities, traits, and difficulties.
2. Objectives with community activities, traits, and problems.
3. Pupil activities with possible causes of difficulty.

4. Objectives with topics of the course.
5. Topics of course with lists of materials.
6. Objectives with lists of materials.
7. Materials with pupils' interests.
8. Materials with pupils' abilities.
9. Pupils' methods of work and study with learning procedures.
10. Test results with class achievement.
11. Actual time distributions with desirable time budgets.
12. Characteristics of successful pupils with those of unsuccessful pupils.

The only types of data commonly compared by statistical methods in service studies are test results and class achievement. For most of the other types of data, cross-checking is the preferable method.

Specific Uses. — Comparison is commonly used either to supplement other methods of evaluation or to select certain items of data for more intensive study. When used to evaluate English objectives by comparing them with community English activities, it served to supplement other methods of evaluation. When used to compare the characteristics of successful pupils with those of unsuccessful pupils, the technique is being used to select probable causes of mal-adjustment, each of which may then be given more intensive study in order that the actual causes may be discovered. Comparison should rarely be used as the sole method of interpretation.

The danger involved in using comparison as the sole method of interpretation grows out of the fact that there are so many interrelated factors in most teaching or learning situations that it is difficult to determine the significant ones. By comparison one may discover relations which are probably significant, but these should be subjected to test before their significance can be assumed.

An illustration of this danger may be taken from a recent service study. A principal was making an investigation of conditions favorable for successful study in the high school. The habits of a number of successful students were compared with the habits of a number of failing students. The principal was trying to show that one cause of the failures was attendance at parties and other social affairs. He thought that the poor students went to parties more often than the good students. Actually, he discovered that the average successful student attended four to seven parties a month whereas the average failing student attended almost none. From these results, it is evident that in this school poor scholarship is not caused by excessive attendance at parties since the poor students did not attend parties. Furthermore, it is unwise to conclude that attending parties produces good scholarship, even though the good students attended many parties. As it happened, in this particular school, the successful students were largely from the better homes, financially and socially, where parties were common. The inter-

relationship of social, economic, hereditary and psychological factors is such that no final conclusion could be drawn from such comparisons. Yet, if the principal had found that the better students attended fewer parties, without further investigation, he would probably have concluded that poor scholarship was due to attending parties. It is a very dangerous and unwise practice to draw conclusions from comparisons, especially conclusions about causes. However, comparison is a valuable means of indicating factors that require further study by other methods, such as analysis, tests and experiments.

Criteria. — Comparison consists essentially in noting pertinent relationships between two or more types of data. What relationships are pertinent in a given case, depends upon the purposes of the study. For example, in comparing certain reference books with the basic materials used in a history course, if the pupils are all good readers, the topics covered and the nature of the treatment might be the most pertinent comparisons to make. On the other hand, if one wishes to select some reference reading for certain poor readers, the vocabulary and style of the reference might be compared with those of books which the pupils can read with ease. Hence, the purpose of the comparison must be *clearly defined* and the relationships made must be *pertinent* to the problem.

Since hundreds of relationships might conceivably be made among items of data, for the sake of *adequacy*

it is helpful to outline probable relationships in advance to serve as guides so that fruitful comparisons will not be neglected. Furthermore, the data must be sufficiently *specific* so that the relationships may be noted more easily. Relationships among general items are so many as to make it easy to overlook important comparisons. *Familiarity with the pertinent characteristics* of the data is therefore essential for the person making the comparison.

Finally, an important problem is involved in meeting the service study demand for *simplicity* without sacrificing the desirable characteristics of *objectivity* and *precision*. When the items of data are very specific and the characteristics to be compared are easily noted, the comparison can be made rather systematically by noting the relationships directly. Thus, a list of questions children ask about nature can be checked directly against the topics in a nature study course to indicate the topics to be given special emphasis. This simple method of checking is quite objective and sufficiently precise for specific items of data.

On the other hand, when the data to be compared are quite numerous and the characteristics may be rated numerically, simplicity may be sacrificed for greater objectivity and precision. For example, in a recent study of causes of failure in a history class, the teacher wished to compare the pupils' reading ability with their knowledge of history. As far as she could tell from a simple, direct comparison, Frank was a

good reader and good in history, Mary was a good reader and fair in history, John was a poor reader and good in history, Ellen was a poor reader and good in history, and so on. She rather thought from her direct comparison of the data that reading ability had an important relationship to success in history but her judgment was very subjective and lacked precision as to how significant the relationship might be.

Statistical methods of correlation provide comparisons in such cases which are objective and precise. In the illustration given, the teacher gave the pupils a reading test and also a test in knowledge of history. When the two sets of test results were correlated the coefficient of correlation proved to be $.78 \pm .06$. This shows a highly significant relationship, but, of course, it does not prove that ability in reading causes success in history. The correlation only shows that good readers are in general also good in history. A further study should then be made to see whether training in reading will improve success in history. Methods of correlation provide objective and precise techniques of comparison and should be used when these criteria are more important than simplicity.

Procedure. — 1. Clearly define the purpose of the comparison. This will help to suggest pertinent relationships. Thus, in an investigation of pupils' methods of study, the statement of the purpose "What habits are related to successful study and what habits are re-

lated to failure?" suggests several relationships which are possibly pertinent to the investigation.

2. Outline probable relationships for which to seek. This will serve to direct attention toward fruitful comparisons. Thus in the illustration above, some probably fruitful comparisons would be: Schedules of study followed by good and poor students; Reading abilities of good and poor students; Methods of using reference books followed by the two groups, etc.

3. Note which of the comparisons involve characteristics which can be measured numerically or can be rated with some precision. These characteristics can be correlated statistically. Such statistical methods should be used whenever a series of measurements can be made of each characteristic. In the preceding illustration, reading abilities may be measured numerically while school success can be rated with fair precision. Furthermore, as many measurements can be made as there are pupils in the school, some 288. Hence, this relationship had better be a statistical correlation. Study schedules and methods of using references were compared by cross-checking.

4. For those characteristics to be compared by means of statistical correlations, obtain the necessary measurements and then compute the coefficient of correlation.[1] The computation of correlation coefficients is not

[1] See Karl J. Holzinger — *Statistical Methods for Students in Education*, Chapters 9, 10, and 14, Ginn & Co., for a description of correlation methods.

described here because every manual of statistical methods contains a more or less complete account of procedure. For those unfamiliar with statistical methods, a much better and more detailed description is needed than can be given here. Hence reference is made in a footnote to a volume on statistical methods in education. A somewhat complete list of books on educational statistics are listed at the close of Chapter II.

5. For comparisons not statistical in nature, make certain that the items of data are sufficiently specific so that their characteristics are quite distinct. Thus, in comparing an annotated bibliography with the course of study in history in order to select references to be examined more carefully, if the annotations are so general as, "Deals with colonial period," or "Deals with English history," the reference list cannot be so easily compared with the objectives or topics of the course as though they were worded, "Describes the hardships encountered in founding New England," or "Accounts for the rise of the English Parliament." The more specific items of data are more easily compared.

6. Make certain that the one who is to make the comparison is familiar with the pertinent characteristics of the data.

7. There are two graphic methods quite commonly used to facilitate comparisons. The simplest of these consists in placing the two lists of data side by side on the same sheet and checking or drawing lines be-

tween items which are similar. Thus, in an investigation of learning procedures, through observation of pupils at work and through interviews, two lists of procedures were obtained. One list contained each of the procedures followed by six of the best students in the class. The other list contained the procedures followed by six of the poorest students in the class. The two lists were compared by checking each procedure found in both lists. As a result, those left unchecked in the first list were procedures followed by good students but not followed by poor students. These procedures should be investigated further since they are probably desirable methods of work which poor students should learn to use. On the other hand the procedures not checked in the second list are methods followed by the poor students but not by good ones. Such procedures should be investigated further since it is probable that they are methods of work which are not effective and which poor students should not use. This technique of checking is particularly useful when the two sets of data contain some items in common so that all that is necessary is to locate the identical items.

8. On the other hand, many comparisons are made between items of data which are not identical, but which are related. For such comparisons it is helpful to use a method which indicates what the relationships are, so that the comparisons will be clear to others. The cross-checked table is helpful for this purpose and

very widely used. The various "tabular analyses" contained in this book are typical illustrations of cross-checked tables. In these tables, the page is divided into vertical columns and horizontal rows. Each of the techniques used in investigations is listed in a vertical column, while each of the sources and data is listed in a horizontal row. Each intersection of a column and a row represents a comparison between a technique and a source. The types of data obtained by applying this technique to this source are shown at each intersection, for the various problems covered. Hence, the table shows not only that the technique can be applied to a certain source, but also what type of data results.

References. — Examples of this technique may be found in the following type studies and specimen studies:

Defining Objectives. Type Study, Steps 4, 5; Specimen Studies, No. 7, Step 5; No. 8, Steps 4, 5; No. 9, Step 1.

Constructing or Reorganizing the Course. Specimen Studies, No. 2, Steps 1, 6; No. 3, Step 2; No. 4, Steps 4, 8; No. 5, Steps 3, 4, 5, 6; No. 8, Steps 6, 7.

Selecting Text Materials. Type Study, Steps 1, 2; Specimen Studies, No. 3, Step 4; No. 4, Steps 2, 3, 4; No. 5, Steps 4, 7, 8, 9; No. 6, Step 2.

Adapting Prescribed Materials to a Given Class. Specimen Studies, No. 2, Step 2; No. 3, Step 3; No. 7, Steps 3, 4, 5; No. 10, Steps 3, 4.

Selecting Learning Procedures. Specimen Study, No. 1, Step 5.

Constructing Exercises and Direction Sheets. Specimen Studies, No. 5, Step 3; No. 6, Step 4.

Motivating. Specimen Studies, No. 1, Steps 1, 4; No. 2, Step 6; No. 8, Step 1.

Testing. Type Study, Steps 1, 2, 3, 4, 5; Specimen Studies, No. 1, Steps 1, 4, 5, 6; No. 2, Step 2; No. 4, Step 2; No. 5, Step 4; No. 6, Step 3; No. 7, Steps 4, 5; No. 8, Step 2; No. 9, Step 5.

Grading and Sectioning Pupils. Specimen Studies, No. 1, Step 4; No. 4, Steps 4, 6.

Managing the Class. Specimen Studies, No. 1, Steps 3, 4; No. 11, Step 5.

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14. SPACE AND FREQUENCY COUNTS

Space and frequency counts are methods whereby certain types of data may be compared in terms of numbers. Such comparisons are noteworthy because they are entirely objective. The methods represent special phases of comparison and individual judgment. As service study techniques they are simple, easily applied, and highly reliable.

Types of Data. — *Space* counts are naturally applied only to data found in printed matter which can be described in terms of the number of inches, columns,

paragraphs or pages of space occupied by the words written about particular topics. Hence, whether a space count can be used depends rather upon the form in which the data appear than upon the nature of the data. However, in current studies, six types of data appear to lend themselves to this technique more readily than others.

Types of Data Commonly Evaluated by Means of Space Counts

1. Objectives discussed in professional literature.
2. Problems discussed in general literature.
3. Course topics treated in textbooks.
4. Reading materials appropriate to a given course as found in textbooks.
5. Traits discussed in general or textbook literature.
6. Activities related to a given course or to special phases of community life as discussed in popular or technical literature.

In the same way, *frequency* counts can only be applied to data in which each item is listed separately as often as it occurs, so that it is possible to count the frequency of each occurrence. Thus, a teacher making a collection of misspelled words occurring in history papers may evaluate each word by the frequency of misspelling, if she lists the word each time she finds it misspelled. On the other hand, if no words are misspelled more than once or if no two pupils misspelled the same word, a frequency count would be useless.

Hence, the form of the data is the significant factor determining the use of this technique. Nine types of data are commonly evaluated by this method, as follows:

Types of Data Commonly Evaluated by Means of Frequency Counts

1. Specific Objectives.
2. Problems of Pupils and of Community Groups.
3. Activities of Pupils and Community Members.
4. Traits of Pupils and of Community Members.
5. Topics of a Course.
6. Pupils' Difficulties in Attaining Objectives.
7. Specified Materials for the Class.
8. Specific Abilities of Pupils.
9. Specific Learning and Teaching Procedures.

Specific Uses. — Space counts are essentially a means of determining what emphasis other persons believe should be given to certain items discussed in print. If a proportionally large amount of space in periodicals or books is devoted to the discussion of a given item of data, the writer, the editor, or the publisher presumably considers that item to be significant. Hence, a measurement of the relative space devoted to certain items of data, is a measurement of the relative valuation placed upon these items by the writers, editors, or publishers of the literature consulted.

Since space count is not a direct method of evalua-

tion, it follows that it should be applied only to data which cannot be evaluated directly. Studies made to determine major objectives, to collect significant life problems of a general nature, to select important topics in a course, to select reading materials most helpful for a course outline, or to determine major traits or activities deemed highly important by current writers — these are uses to which space count is best adapted, since conditions often prevent direct evaluation of such items. Any indirect method of evaluation should be supplemented by individual judgment, and, if possible, by group rating.

Frequency count is useful in so far as frequency is an adequate standard to apply to the data collected. How frequently an item of data occurs is sometimes an important measure of its value for certain school purposes, but it is never the only measure of value. In determining the words needing greatest emphasis in spelling, a study shows that "the" and "and" are most frequently written. It does not necessarily follow that these words should be given greatest emphasis in the spelling class. The criterion, "difficulty of learning to spell," is clearly of equal importance. Hence, the use of frequency count should be supplemented by other methods whenever other criteria than frequency have equal or greater significance in evaluating the given data.

Specifically, then, to evaluate specific objectives for a given course or subject one might count the frequency

with which each objective is mentioned in professional literature. One may also evaluate the activities, problems, and traits of pupils and community members or the learning difficulties of pupils by counting the frequency with which each is observed or recorded. Topics of a course, various specified materials for the class, and specific learning and teaching procedures may be evaluated by counting the frequency with which they are listed in the professional literature examined or by observing the frequency with which they are used by other teachers.

Criteria. — The most obvious criterion applicable to both space and frequency counts is *reliability*. If the items of data and the units of measurement are clearly defined, all who measure the space or count the items will obtain approximately the same results. Furthermore, *exactness* is a criterion applicable to both techniques. Space measurements can be made with precision to a fraction of an inch, or paragraph, or page, or column depending on the unit of measurement. The frequency with which an item occurs in a collection of data may be counted accurately. Both the reliability and the exactness of techniques explain their popularity. Yet the confidence inspired by the objectivity of such measures often tempts investigators to apply them to data that should be evaluated by other techniques.

The objectivity of space measurement does not alter the fact that the amount of space allotted by the

writer, editor, or publisher to a given topic is largely a matter of subjective, individual judgment. Thus the fact that a certain magazine devotes eight pages to an article on Alaska may imply that Alaska is more significant or interesting to the readers this month than China. Yet because Alaska is given four times the space China is given, it does not follow that the relative value of the two countries to school geography is objectively demonstrated by this comparison.

In the same way, the objectivity and exactness of a frequency count may tempt investigators to rely upon this method when a frequency count is not applicable or when it needs at least to be supplemented by ratings with reference to other criteria. In the *Commonwealth Teacher Training Study*[1], activities of teachers were evaluated with reference to frequency and to three other selected criteria as well. It was found that the evaluations with reference to frequency alone were not identical with ratings with reference to difficulty of learning. Hence, reliance upon frequency counts would have neglected activities which being difficult to learn, should be given some emphasis in training teachers.

It follows, then, that *validity* is a quality to be considered before deciding to employ these techniques. Is the space devoted to a given item of data or the frequency with which an item of data occurs a valid measure of the significance of this item for the purposes of the study? *Adequacy* must also be considered

[1] Loc. cit.

in this connection. Rarely is space count or frequency count alone an adequate means of evaluation. Individual judgment or group rating, at least, should be used too as an additional check upon validity and adequacy.

Finally, *simplicity* must be considered in selecting these techniques. Unless the space measurements are quickly made and the frequencies of occurrency easily counted, the validity of the techniques is seldom sufficient to justify their use.

Space Count. — *Procedure.* 1. Determine whether the technique applies to the data collected. The technique is applicable when the data occur in written or printed sources in solid make-up so that the space occupied by the data may be measured. The sources in which space counts may be made are books, magazines, newspapers, letters, diaries, pupils' papers, catalogues, bulletins, sign boards, et al.

2. Determine whether the technique is a valid means of evaluation for the purposes of the study. The relative space given to items of data in books, magazines, newspapers, and bulletins is a measure of the importance of the data in the judgment of the authors, editors, or publishers or a measure of their judgment of the interest the readers have in these data. The amount of space in letters, diaries, and pupils' papers is a measure of the importance or interest that the writer has in the data or his judgment of the interest or importance which the readers will have in the data.

The relative space devoted to advertisements is a combination measure of many factors such as the wealth of the advertiser, the need for advertising in order to sell the product, the advertiser's judgment of the relative interest of the readers in such products, and the like. If any such evidence is valid for the purposes of the given study, space count may be used.

3. Define the items of data to be measured, the sources in which measurements are to be made, and the unit of measurement. Such definitions are essential if the count is to be objective. Consider, for example, an attempt to evaluate by means of space count the importance of the immigration problem as one of a number of social-civic problems, for a course in social science. In this case it would be essential to have a clear definition of what constitutes a printed discussion of the immigration question. Shall articles be counted in which passing reference is made to immigration or only those in which this question is the main issue? Shall discussions of the need for imported labor be considered a reference to immigration or shall only direct references using the word "immigration" be counted? The items of data should be so clearly defined that one may readily identify the selections to be measured. It is equally necessary to define the sources from which the selections are chosen.

It is also necessary to decide on the units of measurement. When a reference to immigration is found in a book or magazine article, shall the space occupied by

the entire article or book be measured or shall only those paragraphs be counted which refer specifically to the topic? In general it is more practicable to consider only material in which the topic under consideration is the main theme and to measure the total space occupied by the article, chapter, or section in which the topic is discussed.

It is usually better to measure space in books by pages or fractions of pages. If certain books have unusually large or small pages, the number of such pages may be multiplied by the number which represents the ratio of the size of the page of such books to the size of the page of the standard book chosen. The page is a better unit than the chapter, paragraph, or section since pages vary less with individual authors.

The unit commonly employed to measure the space occupied by articles in newspapers and magazines is the column-inch. This necessitates only the measurement in inches of the length of the articles if they are set in columns of fairly uniform width and in type of fairly uniform size.

In measuring written material in letters and pupils' papers a page measure or linear measure are quite inaccurate since the size of handwriting varies so greatly with individuals. A more accurate measure is the number of words written. This may be estimated for each writer by counting the words on a single page and then multiplying by the number of pages dealing with the given topic.

4. After defining the items of data, the sources, and the units of measurement, measure the space occupied by the given items in the unit defined.

5. Tabulate the total space devoted to each item. Compare the totals to determine the relative value of each item.

6. Supplement this measurement, when possible, by individual evaluation and group ratings, or by more valid methods of evaluating the data in question.

Frequency Count. — 1. Determine whether the technique applies to the data collected. The technique is applicable when each item can be noted as often as it occurs. Three general types of sources may be consulted for frequency counts. Literature, from both printed and written sources, may be examined to count the number of times certain items occur. Persons may be observed, tested, or interviewed to note the frequency with which certain activities are performed, certain traits are exhibited, certain problems or difficulties are encountered, certain abilities are displayed, or certain items are mentioned. The physical environment may be surveyed to note the number of times certain objects appear and the frequency with which certain phenomena occur.

2. Determine whether the technique is valid for the purposes of the study. The relative frequency with which certain items appear in the literature or are mentioned in conversation is a measure of the importance of the data in the judgment of the writers or

speakers or else a measure of their judgment of the interest the readers or auditors have in the data. The relative frequency with which items are observed is a measure of the number of opportunities persons may have for experiences with these data. If such evidence is valid when applied to the problem of the study, frequency count may be used.

3. Define the items of data to be counted, the sources in which the count is to be made, and the unit to be counted. These definitions are essential if the count is to be objective. For illustration, consider an attempt to evaluate, by means of the frequency count, the significance of certain places to be taught in place geography. Are all places, continents, nations, states, provinces, cities, seas, lakes, rivers, mountains, et al., or only certain of these to be counted? Are only actual occurrences of the name of a place to be counted or will possessive forms and pronouns be considered? Thus, if the word "China" is to be counted each time it occurs, is the word "Chinese," or the pronoun "her" when referring to China to be counted. The items of data to be counted should be so defined that one may identify them precisely.

Furthermore, the sources need to be defined. If books or magazines are to be considered, what books, what magazines, and which issues are to be examined? If persons are to be observed, tested, or examined, the persons need to be selected — whether pupils, teachers, parents, or community members. If the physical en-

vironment is to be surveyed, the specific locality will need to be defined.

In addition, the unit must be defined. If items are to be counted in the literature, shall an item which occurs twenty times in a single article be counted as twenty or shall it be considered as only a single mention? In evaluating objectives proposed by teachers, shall each mention by the persons interviewed be counted separately or merely the number of persons who mention each objective? Such questions indicate the need for defining the unit to be counted.

A study of place geography from magazines, reported by Charters[1], indicates that there is a very high correlation between the results obtained when only explicit occurrences of the name of the place are counted as against explicit occurrences, possessive forms, and pronoun references to the place. In service studies it is more practicable to count only explicit references, and to count authors, or persons interviewed as units rather than the number of mentions. On the other hand, when evaluating activities or difficulties, a better measure of importance is obtained by counting the number of times each person encounters the difficulty or performs the activity.

4. After defining the data, the sources, and the units of measurement, consult the sources, counting each occurrence of the unit selected.

5. Tabulate the total number of occurrences for

[1] W. W. Charters, *Curriculum Construction*, pp. 270-72.

each item of data and compare these totals to determine the relative value of each item.

6. Supplement the count, when possible, by individual evaluation and group ratings, or by other more valid methods of evaluation.

References. — Examples of space and frequency counts may be found in the following type studies and specimen studies:

Defining Objectives. Specimen Studies, No. 3, Step 4; No. 6, Step 4; No. 7, Step 5; No. 9, Step 6.

Constructing or Reorganizing the Course. Specimen Study, No. 2, Steps 2, 3.

Selecting Text Materials. Type Study, Step 2; Specimen Studies, No. 4, Step 2; No. 6, Step 7; No. 7. Step 4.

Adapting Prescribed Materials to a Given Class. Type Study, Step 3; Specimen Studies, No. 1, Step 4; No. 4, Step 1.

Selecting Learning Procedures. Specimen Study, No. 3, Step 1.

Constructing Exercises and Direction Sheets. Specimen Study, No. 3, Step 1.

Motivating. Specimen Study, No. 4, Steps 2, 3, 5.

Testing. Specimen Studies, No. 1, Steps 4, 5; No. 3, Step 4; No. 7, Steps 3, 4; No. 8, Step 2.

Grading and Sectioning Pupils. Specimen Study, No. 2, Step 4.

Managing a Class. Specimen Studies, No. 1, Step 3; No. 3, Steps 3, 6; No. 8, Step 3.

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15. Testing

General Purpose. — Testing is used in service studies to determine whether certain specified traits are possessed by pupils and if so, to what degree. Although tests may be applied to teachers, school officials, parents, and community members, the service study largely confines testing to pupils.

The development of testing during the past two decades has been so rapid that the field of tests and measurements has become highly specialized. The selection, construction, application, and interpretation of tests for various specific purposes require a large amount of definite information which cannot be provided within the scope of this discussion. This section is therefore confined to general considerations involved in testing as employed in service studies. For more specific and detailed discussions the reader is referred to the bibliography at the close of this section, and at the close of Chapter IV.

Types of Data. — As stated above, tests are used to measure pupils' traits. The term "trait" covers any characteristic reaction of a pupil or group of pupils. Hence tests provide information concerning a wide variety of data. The following list indicates certain types of data obtainable by tests.

Types of Data Commonly Obtained by Testing

1. General and specific abilities of pupils.
2. Pupil-achievement in school subjects.

3. Specific difficulties encountered by pupils.

4. Pupils' interests in specified traits, activities, and materials.

5. General and specific needs of pupils.

6. Degree to which pupils are attaining desired objectives.

7. Pupils' methods of study.

8. Elements of the course of study which need improvement.

9. Relative difficulty of specified school activities.

10. Time required for specified school activities.

11. Pupils who are not deriving maximum benefit from school work.

Specific Uses. — Testing is helpful in studies of the curriculum, of methods of learning and teaching, and of school administration. To define objectives, pupils may be tested with reference to a tentative list of objectives to determine which objectives require greater emphasis. Also objectives must be chosen within the pupils' abilities. Therefore, a tentative list of objectives may be compared with the results of tests to determine which objectives are possible of attainment. In assigning objectives to a given grade or portion of a grade, tests may be used to determine relative difficulty and interest to pupils of a given grade. In general, the objectives easier to attain should be stressed early in the course. Also certain objectives may be selected for a given grade by tests of pupils' interest and readiness.

In constructing or reorganizing a course, tests reveal

pupils' errors and difficulties which the course should serve to overcome. When the course has been tentatively constructed and taught, tests reveal difficulties which indicate specific points needing improvement. Tests of pupils' reading ability and interests are valuable aids in choosing text materials for a given class. When materials have been selected and tried out, tests may be used to determine pupils' difficulties and preferences. In adapting prescribed materials to a given class, tests of pupils' intelligence, ability in the subject, reading ability, and specific difficulties are useful in making helpful adaptations.

In selecting learning procedures, tests can be used to define pupils' difficulties and methods of work and study which will reveal the inefficient methods. Exercise and direction sheets should be constructed to correct such methods when revealed by tests. The effectiveness of the exercises may be determined by testing pupils before and after the exercises have been used. The pupils who need additional motivation are often identified by comparing results of achievement tests with results of intelligence tests.

Tests are widely used for determining the actual outcomes of instruction in a given school when diagnosing the needs of the school population. Tests are also used to classify pupils, since they serve to indicate pupils of similar abilities and similar degrees of achievement. The tentative plan of classification may be revised by testing to find pupils improperly placed.

This brief summary should suggest the wide variety of uses for testing in service studies. This variety of important uses, explains the striking development of tests and measurements within recent years.

Criteria. — The most important criterion to apply to a test is *validity*. Unless the test actually measures the trait or traits which it is supposed to measure, the results have little value. In a recent study, a test calling for the names and titles of pictures was used to measure the degree to which the pupils of a class were able to appreciate good art. Obviously, this test is not a valid measure of the art appreciation, hence the results do not show the success of the previous instruction. Recently a group of principals and professors of education collected many samples of tests used by teachers to measure various pupil traits. This more or less expert group of principals and professors agreed that about sixty per cent of the tests were not valid measures of the traits which the teachers were attempting to measure. It is highly essential that more attention be given to the validity of tests used for particular purposes.

A second significant criterion is *reliability*. A reliable test is one which will give similar results when applied more than once to the same persons. Reliability is usually expressed by the coefficient of correlation between the scores obtained by a group of persons on one form of the test and the scores obtained by the same group of persons on a second form of the

test. Hence, reliability indicates the degree to which the test results are not due to mere chance variations in pupils' reactions or to the inadequacy of the sampling of the test items but are probably due to the actual and characteristic reactions of pupils. Tests containing only a few items, containing opportunities for guessing, or scored only by individual judgment are likely to be unreliable. Hence, *objectivity* is a third criterion to apply to tests.

A fourth criterion is that tests be *analytical.* Test results which indicate general levels of achievement only, and do not reveal specific difficulties and attainments are to be avoided. Tests should be preferred which identify specific difficulties that need to be overcome and specific outcomes that have been attained.

A fifth criterion is *practicability.* Since tests in service studies must be applied while performing the many duties of teaching or administration, the time required to give, score, and interpret the tests is a matter of vital concern. In a recent study of children retarded in arithmetic, tests were needed to discover pupils' specific difficulties. The Buswell-John test was selected as most helpful because of its analytical character, but the teachers had no time to use such an individual test. In selecting standardized tests or mimeographed tests, cost is another important factor in practicability. When possible, validity, reliability, and analysis should not be sacrificed for relatively slight differences in time or cost.

Finally, *adequacy* is an important consideration. Unless tests are so chosen that they measure all of the important traits that need to be measured for the purposes of the given study, estimates of these traits should be obtained by other means. Individual judgments of pupils based on observation and interview, or group ratings, or both are often needed to supplement test results.

Procedure. — 1. When the study requires definite information about the traits possessed by the pupils, their abilities, their achievement, their interests, their difficulties, or their methods of work, tests of some sort are necessary.

2. List the specific objectives, traits, abilities, methods of procedure or interesting activities that need to be tested. The specific characteristics likely to be tested in a given study have been described in connection with *Types of Data* and *Specific Uses*.

3. Obtain from test bibliographies, textbooks on testing, special methods texts, courses of study, supervisors, or other teachers, suggestions regarding the available tests that apply to one or more of the desired characteristics. Where several such tests are available, base the selection upon their validity, adequacy, and reliability as determined by experts; also upon their analytical character, their objectivity, ease of administration, and cost.

4. Note the characteristics for which no satisfactory tests are available. Determine from accessible authori-

ties and from professional literature, to what extent these characteristics can be tested by self-constructed tests, and what forms of tests are most effective for each characteristic.

5. After consulting the literature on test construction, draft in tentative form such tests as can readily be prepared. In preparing such tests use observation, pupil interviews, and professional literature to determine what pupil-responses may be used to measure the desired characteristics. Note the directions, questions, or facts that may be used to produce such responses.

6. Submit the self-constructed tests to competent critics for improvement. Make any helpful changes, then obtain enough of the tests purchased and constructed to supply the pupils in question.

7. Administer the tests, score them, and tabulate the results. Where there is any question of their adequacy, supplement the test scores by the personal judgments of present and former teachers and interested parents. Such judgments should be based upon observations of pupils and pupil interviews as well as upon school reports.

References. — Examples of testing may be found in the following type studies and specimen studies:

Selecting Text Materials. Specimen Study, No. 3, Step 2.

Adapting Prescribed Materials to a Given Class. Type

Study, Step A; Specimen Studies, No. 3, Step 1; No. 4, Step 1.

Selecting Learning Procedures. Specimen Studies, No. 1, Steps 1, 5; No. 3, Steps 1, 4; No. 5, Step 3; No. 6, Step 2; No. 7, Steps 1, 5; No. 8, Steps 1, 4; No. 9, Step 3.

Constructing Exercises and Direction Sheets. Type Study, Step 1; Specimen Studies, No. 3, Steps 1, 4; No. 7, Step 1; No. 12, Step 1.

Motivating. Specimen Studies, No. 2, Step 1; No. 5, Step 1; No. 7, Steps 3, 4; No. 8, Step 1.

Testing. Specimen Studies, No. 1, Steps 3, 4, 5, 6; No. 2, Step 6; No. 5, Steps 3, 4; No. 6, Steps 1, 2; No. 7, Steps 1, 2, 3, 4, 5; No. 9, Steps 1, 5.

Grading and Sectioning Pupils. Type Study, Step 1; Specimen Studies, No. 1, Step 6; No. 2, Steps 2, 3; No. 4, Steps 1, 6; No. 5, Step 3.

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16. Experiment

General Purpose. — Experimentation is the distinctive feature of research. Only in so far as the teacher or administrator applies his tentative solutions to a problem and finds them satisfactory, is the problem actually solved. Hence experiment is indispensable in any type of service study. No matter how promising a solution may seem on *a priori* grounds, it must stand the test of trial before it can be accepted. Yet when used to answer certain troublesome questions of general theory, experiments usually demand more experience, skill, and time than the teacher in service can supply.

The chief purpose of a service-study experiment is thus to test solutions to the problem that have been suggested by previous study of the evidence as applied to the given class or school. Since a service study is primarily concerned with difficulties in specific situations, whereas research demands results of general application, service-study experiments are useful in fields where research experiments are inconclusive.

Types of Data. — Since experiments may be used to test the solutions proposed for any service problem, the types of data to which the technique may be applied are as many and varied as the solutions proposed. Hence the types of data listed in the tabular analyses by no means represent all the types that may be studied experimentally.

Specific Uses. — The purpose of a service study determines the value of experiment. In defining objectives, a tentative list of objectives may be experimentally adopted by teachers with a view to discovering the objectives that are inappropriate for the given class. A newly constructed course of study may be tried out to obtain suggestions for improvement. Various reading materials may be assigned to pupils in order to evaluate the readings in terms of pupils' interests, abilities, and needs. Other prescribed materials, illustrations, or exercises may be tested in the same way. Experiment is obviously necessary in selecting the methods of learning or teaching that are best suited to a given class, and only slightly less useful in evaluating methods of school and class management. Solutions to any school problem must stand the test of practicability, and the question "will it work?" is best answered by experiment.

Criteria. — One of the most common errors in a service experiment is to attribute all improvement or lack of improvement in the teaching situation to the procedure being tested. Differences in the attitudes or abilities of pupils, in classroom conditions, and in the enthusiasm and effort of the teacher are disregarded. It is essential during an experiment either to control other influences which might affect the results, or else to calculate the effects of such influences so that proper allowance can be made for them when the results are interpreted. Hence, a most significant cri-

terion for experimental technique is the *control of significant extraneous factors.*

A second criterion is the *validity* of the tests applied to the proposed solution. A recent study developed a plan of teaching study habits to college freshmen. An attempt was made to determine the success of the plan by comparing the percentage of failures after training in study habits with the previous percentage of failures. The percentage was practically the same in both cases. Further investigation revealed the fact that the college instructors had no reliable standards for success, and accordingly failed the poorer students of each class. It is probable that the entire student body might have improved greatly in achievement without reducing the percentage of failures. This test of the plan of teaching study habits is obviously not valid.

A third criterion is the *objectivity* of the tests applied to the proposed solution. In service studies, the teacher or administrator often estimates the success of a procedure by his personal judgment. Often, too, in such cases, prejudice exists either for or against a proposed solution so that the judgment is likely to reflect his personal prejudice. As an illustration of this tendency, three different plans for eliminating errors in pupils' compositions were advocated by a group of teachers. In each case the teacher proposing the plan said that he had tried the plan and found it most effective. When asked what evidence he had

to indicate the success of the plan, each teacher merely replied that he liked it better. In no case was a single item of evidence presented excepting the teacher's judgment.

This illustration is not given to suggest that there should not be three different "best" plans for eliminating pupil errors in composition. Inasmuch as the pupils, school conditions, community conditions, specific errors, and teacher characteristics are different, each situation may require a different plan. However, it is highly significant that none of the teachers could present a single item of evidence to support the plan recommended.

It must be recognized that some of the most valid measures of success in teaching have been determined by tests which are not completely objective. For example, the interest of pupils, the elimination of intense emotional reactions in teacher and pupil, such traits as industry, honesty, carefulness, and others, are highly significant measures of success, but are exceedingly difficult to measure objectively. Hence, the success of an experiment often needs to be determined by objective evidence supplemented by the personal judgments of competent observers in addition to the teacher's opinion.

A fourth criterion for an experiment is *reliability*. It should be carried far enough to produce definite results. Furthermore, the evidences of success should be so abundant and marked as to indicate the effects

of the procedure being tested and not the effects of chance factors.

A fifth criterion is *practicability*. If an experiment is to be carried on as part of a service study, it must require no more time and money than teachers and administrators can devote to it. Hence, experiments involving expensive or elaborate apparatus and individual controls should not be undertaken.

Procedure. — 1. Outline in detail the proposed solution or procedure to be tested. If the solution consists of materials to be tested, prepare the materials for use. If the solution consists of teaching or administrative methods to be tested, organize the methods into a working plan.

2. If the proposed solution is complex, analyze it by noting the parts which may be tested separately. This step is necessary because the failure of the plan as a whole may be due to a few defective elements that are readily discovered when the elements are tested one at a time.

3. Indicate types of evidence which would be valid measures of each element. Such evidence depends upon the nature of the elements tested. If the experiment is to test materials of instruction, evidence with regard to pupil interest or pupil achievement is valid. If methods of learning and teaching are tested, evidence concerning the attainment of the specified objectives is valid. Select types of tests which are valid, objective, reliable, and adequate. (See preceding section on Testing.)

4. After selecting the tests to be used, list the attendant conditions of the experiment which may affect the test results. Usually such factors as the following will be listed: Pupils' intelligence, pupils' previous success in the subject, time of day, enthusiasm and attitude of teacher and size of class.

5. After listing such factors, try to control them in one of the following ways:

(a) Provide for a control group and an experimental group in which all extraneous factors are identical. Usually the two groups should be composed of pupils who have similar intelligence scores and similar achievement scores; the two classes should be held at the same time of day, or the time of day may be alternated — one group early and the other late for half the time, then the groups reversed for half the time; the same teacher should teach both classes. Similar intelligence and achievement scores may be obtained by giving the entire class appropriate tests. After scoring the tests, arrange the scores in order and then select the members of the two groups by placing the pupil making the highest score in Group A, the second highest in Group B, the third highest in Group A, the fourth highest in Group B, and so on.

After selecting the pupils for the experimental group and the control group, arrange to conduct the two classes in exactly the same way, excepting for the method or solution to be tested. Apply the solution to the experimental group but not to the control

group. Continue the experiment long enough to show definite results. If possible, alternate the groups for a second period, trying the proposed solution with the group which had been the control group and employing some other method with the class which had been the experimental group.

(b) Where parallel groups cannot be provided, test the effectiveness of the method previously used. Then, apply the new method to the same class, making every effort to keep the extraneous factors unchanged. Continue the experiment long enough to obtain definite results for comparison with the results of the previous method as shown by similar tests.

6. Apply the tests selected in Step 3. Be sure to include evidence of interest, attitude, industry, and the like, as obtained by observation and interview. Where necessary, supplement the test results by individual judgment and by the group ratings of competent observers.

7. When possible, compare the average results obtained from the proposed solution with the average results obtained by the use of the previous method. The significance of any difference should be compared with the probable error of each difference. The probable error of the difference between two averages of uncorrelated values is equal to the square root of the sums of the squares of the probable errors of each average, i.e., $\text{P.E.}\ (M_1 - M_2) = \sqrt{(\text{PEM}_1)^2 + (\text{PEM}_2)^2}$. Unless the difference obtained is greater than three

times the probable error of the difference, it is quite possible that the difference is due to chance errors in measurement. Space does not permit a description of the methods for calculating probable errors. If the reader is not familiar with such methods, he should refer to one of the books on statistical methods given at the close of Chapter II and also refer to the bibliography at the close of the section on Sampling.

8. Those elements of the proposed solution which give distinctly better results as shown by the experimental evidence should be retained. Further search should be made to collect more successful elements to replace the elements which prove ineffective.

References. — Examples of experimentation may be found in the following type studies and specimen studies:

Constructing or Reorganizing the Course. Specimen Studies, No. 4, Step 9; No. 5, Steps 6, 7; No. 7, Step 6.

Selecting Text Materials. Specimen Studies, No. 3, Steps 2, 3; No. 5, Steps 10, 11; No. 7, Steps 3, 4.

Adapting Prescribed Materials to a Given Class. Specimen Study, No. 2, Step 5.

Selecting Learning Procedures. Specimen Studies, No. 1, Step 5; No. 2, Steps 2, 6; No. 3, Step 4; No. 4, Step 4; No. 5, Step 6; No. 6, Step 4; No. 7, Step 5; No. 8, Step 4; No. 9, Step 4.

Constructing Exercises and Direction Sheets. Type Study, Steps 5, 6; Specimen Studies, No. 1, Step 4; No. 2, Step 5; No. 3, Step 4; No. 10, Step 4.

Motivating. Specimen Study, No. 2, Step 6.

Testing. Specimen Studies, No. 1, Steps 3, 4, 5; No. 3, Steps 2, 3, 4; No. 5, Step 3; No. 9, Step 5.

Grading and Sectioning Pupils. Type Study, Step 3; Specimen Study, No. 4, Step 6.

Managing a Class. Specimen Studies, No. 2, Step 7; No. 4, Step 5; No. 5, Step 5; No. 7, Steps 3, 4; No. 11, Step 5.

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